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VIEW

OF THE CLIMATE AND SOIL

OF THE

United States of America:

TO WHICH ARE ANNEXED

SOME ACCOUNTS OF FLORIDA, THE FRENCH COLONY ON THE SCIOTO, CERTAIN CANADIAN COLONIES, AND THE SAVAGES OR NATIVES:

TRANSLATED FROM THE FRENCH

OF

C. F. VOLNEY,

MEMBER OF THE CONSERVATIVE SENATE, AND THE FRENCH NATIONAL INSTITUTE, AND HONORARY MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY AT PHILADELPHIA, THE ASIATIC SOCIETY AT CALCUTTA, THE ATHENEUMS OF AVIGNON, ALENÇON, &c.

WITH MAPS AND PLATES.

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RPLON

PREFACE.

THE new work I here submit to the public is the fruit of three years travels and residence in the United States, in a frame of mind very dissimilar from that with which I visited the Ottoman dominions, and when the face of affairs was extremely different.

In 1783 I set sail from Marseilles on a pursuit agreeable to my inclinations; and with that alacrity, that confidence in others and in myself, which youth inspires. I gayly left a country of peace and plenty, to live in a land of barbarism and wretchedness, without any other motive than that of employing the time of a restles and active youth in procuring knowledge of a new kind, and through it's means of em-

bellishing the remainder of my life with a radiant circle of reputation and esteem.

In the year 3 on the contrary (1795), I embarked at Hâvre with that disgust and indifference, which the sight and experience * of injustice and persecution impart. Sorrowful at the past, anxious for the future, I was going with distrust to a *free* people, to try whether a sincere friend of that Liberty, whose name had been so profaned, could find for his declining years a peaceful asylum, of which Europe no longer afforded him any hope.

In this disposition I visited successively almost all parts of the United States, studying the climate, laws, inhabitants, and their manners, chiefly with regard to social life and domestic happiness. And such was the result of my observations and reflections, that, considering on one hand the gloomy and boisterous state of France and all

* I had been in different prisons ten months, till after the 9th of thermidor.

Europe; the probability of long and obstinate wars from the contest arisen between prejudices on the decline and knowledge increasing, between despotisms grown old and young liberties arising: on the other the peaceful and smiling aspect of the United States, in consequence of the immense extent of territory to be peopled, the facility of acquiring landed property, the necessity and profits of labour, personal freedom and the liberty of a man's employing his industry in any way he might think proper, and the mildness of the government, founded on it's very weakness: after weighing all these motives, I had formed a resolution, to remain in the United States; when, in the spring of 1798, an epidemic animosity against the French breaking out, and the threat of an imediate rupture, compelled me to withdraw.

Perhaps this would be a proper place for me, to complain of the violent public attacks levelled at me during the latter part of my stay, under the influence of a per-

son, who was then all-powerful; but the election of 1801, making amends for that of 1797, gave me sufficient reparation *.

* I shall point out to the Americans however the absurdity of the principal grievance, by which I was rendered a *suspected person:* (for at that period the language and system were truly those of *terrorism).* I was supposed to be the secret agent of a government, whose axe had not ceased to fall on those like me. A *conspiracy* was fabricated, which I (a single Frenchman) had plotted in Kentuckey, to deliver up Louisiana to the directory (which had but just risen into existence); and this when numerous and respectable testimonies in that very Kentuckey, as well as in Virginia and Pennsylvania, could attest it to be my opinion, declared on occasion of the conduct of the minister G****, that the invasion of Louisiana would be false policy: that it would involve us in a quarrel with the Americans, and strengthen their inclination toward the English: that Louisiana suited France in no point of view: that colonizing it would be too expensive and precarious; and to maintain possession of it too difficult, for want of a navy, and of stability in our government, which was distant, changeable, embarrassed, &c.: and that in short, from the nature of things, it only suited, and must ultimately belong to the neighbouring power, which possessed every means of occupying, defending, and retaining it. This opinion, contrary to that of most of our ministers, exposed me to their disapprobation, nay almost

On my return to France *(prairial an 6)*, it appeared to me, that I should render a service to my countrymen, by composing a work, the want of which I had felt my-

their reprimands, both in America and in France. I have notwithstanding continued to maintain it, in times when it required any degree of courage to avow it.

The World would be astonished were it known, that the animosity of Mr. John A**, at the very time when the great Washington bestowed on me public testimonies of esteem and confidence, had no other motive than the *rancour of an author*, on account of my opinions concerning his book in Defence of the Constitution of the United States. As a man of letters, and as a foreigner, frequently interrogated in a country of perfect freedom, I had had occasion to give my opinion, at a time when their author did not yet occupy the first post in the state. Unfortunately I had adhered to the opinion of one of the best English reviewers, who, treating the book as a compilation without method, and void of accuracy either in facts or in ideas, added, that he should even believe it to be destitute of an object, if he did not suspect a secret one, relating to the country for which it was an apology, and which Time alone would unveil. Now as I interpreted my author, I advanced, that this object was, to court popular favour, and the suffrages of the electors, by a national flattery. When the prophecy was verified by the event, the prophet was not forgotten.

self. Accordingly I formed the design of collecting into a narrow compass not only my own ideas, but those that were scattered about in different works, at the same time correcting prejudices formed during a period of enthusiasm. In the plan I traced I first laid down as a basis the soil and climate: then, following the method which I conceive to afford the most copious information, a systematic arrangement, I considered the quantity of population, it's distribution over the territory, it's division into different kinds of labour and employment, the habits, that is the *manners*, resulting from these occupations, and the combination of these habits with the ideas and prejudices derived from the parent stock. Tracing this stock through history, language, laws, and customs, I showed the romantic errour of writers, who give the name of a *new and virgin people* to a combination of the inhabitants of old Europe, Germans, Dutch, and particularly English from the three kingdoms.

The organization of these ancient and various elements into political bodies led me to recapitulate succinctly the formation of each colony: to show in the characters of it's first authors that mental leaven, which has served as a prime mover to almost the whole system of conduct of their successors, according to a moral truth too little observed, that, in '*political bodies*, as in individuals, first habits exercise a predominant influence over all the rest of their existence.' In this leaven would have been seen one of the principal causes of the difference of character and inclination, that appears more and more obvious in the different parts of the Union.

The crisis of independence, obliging me to take a brief view of it's causes and incidents, would have furnished me with new remarks on it's less known and less observed consequences. A number of facts, omitted or misrepresented, would have established a much greater resemblance than is commonly imagined between the American and

French revolutions, both in the motives, the means of execution, the conduct of parties, and the fluctuations, even retrograde, of the public mind; and finally even to the character of the three principal assemblies, the first of which in both countries was equally reputed to have advanced a whole generation in knowledge before it's contemporaries, and the last not to have kept pace with the knowledge acquired: so that those great political movements called revolutions seem to have in them something automatic, depending less on the calculations of prudence, than on a mechanical series and progress of the passions.

In treating of the period between the peace that established the independence of America and the formation of the federal government, a period but little known to the public, I should have shown the influence of that time of anarchy on the national character; the alteration of the public mind and it's principles by the return of the discontented loyalists, and the

immigration of a number of tory merchants from England; and the change that took place in the primitive honesty and simplicity of the people, occasioned at first by the paper money, and the want of laws and justice, and afterward by the temporary wealth and permanent luxury, that the war of Europe introduced into this neutral country. I should have pointed out the advantages, that every European war procures the United States; the sensible increase they derived from the last, notwithstanding the weak and wavering politics of their government; the national and progressive direction of their ambition toward the West India islands and the continent surrounding them; and the probability of their enlargement, in spite of party divisions and the germes of an internal schism. I should have unfolded the differences of opinion, and even of interest, that divide the Union into eastern states (New England) and southern states, and into an Atlantic country and Missisippi

country; the preponderance of the agricultural interest in these, and of the commercial interest in those; and the weakness of one part, occasioned by their slaves, with the strength of the other originating from a free and industrious population. I should have pointed out a still more active source of schism in the collision of two opposite opinions, styled republicanism and federalism: this maintaining the preeminence of the monarchical or rather despotic form of government over every other; the necessity of absolute and arbitrary power in every system, founded on the ignorance, passions, and indocility of the multitude, and the example of most governments and people, ancient and modern; in short all the old politico-religious doctrine of the royal prerogative held by the Stuarts and tramontanes: the other on the contrary arguing, that arbitrary power is a radical principle of disorder and destruction, since it does not exempt rulers from the passions, errours, or ignorance common to other

men, but even tends to produce and heighten them; that the faculty of being able to do every thing, as it leads to desiring every thing, has a direct and immediate tendency to extravagance and tyranny; that, if the multitude be ignorant and wicked, it is because it receives such an education from such governments; that, supposing men to be born vicious, they can be corrected only by the sway of reason and equity; that this reason and equity cannot be obtained without knowledge, requiring study, labour, and the collision of argument, all which presume an independence of mind, a freedom of opinion, the right to which men derive from Nature herself, &c.; in short, all the modern doctrine of the declaration of rights, on which the independence of the United States was erected. I would have discussed, from what I have heard from the most impartial persons, the consequences these dissensions may have. Whether it be true, that a division into

two or three powerful bodies, at a period more or less remote, would be as stormy and disastrous, as is commonly supposed. Whether, on the contrary, too much unity and concentration in the government would not be of fatal consequence to liberty, left destitute of asylum and of choice; and whether too great a degree of security and prosperity would not radically corrupt a *young people**, who, while they affect to give themselves this name, do not so much confess their present weakness, as disclose their schemes of future grandeur; a people particularly deserving this name of *young* for the inexperience and eagerness, with which they give themselves up to the enjoyments of fortune and seductions of flattery.

I should then have considered in a moral view the conduct of this people and it's

* Whenever you point out to the Americans any weakness or imperfection in their social state, arts, or government, their answer is: 'We are but a young people;' tacitly implying, 'let us grow.'

government, from the period of 1783 to 1798: and I would have proved by incontestible facts, that neither more economy in the finances *, more good faith in public transactions †, more decency in public morals ‡, more moderation of party-spirit, nor more care in education and instruction ||, prevailed in the United States, in proportion to their population, the mass of affairs, and the multiplicity of interests, than in most of the old states of Europe: that whatever has been done there of good and useful, and whatever of civil liberty, and security of person and property, exists among them, is owing rather to popular and personal habits, the necessity of labour, and the high price of all kinds of work,

* The affair of Algiers, and construction of frigates at 1700000 francs [70833l.] a piece.

† Jay's treaty compared with that of Paris.

‡ The affair of Mr. Lyons in full congress.

|| Scandalous disorders in the college of Princetown, and nullity of others.

than any able measures or sage policy of government: that on almost all these heads the principles of the nation has been retrograde since it's establishment: that in the year 1798 different circumstances only were wanting to one party, to have displayed a usurpation of power, and a violence of character, altogether counterrevolutionary: in a word, that the United States have been much more indebted to their insulated situation, their distance from every powerful neighbour and the theatre of war, and the general easiness of their circumstances, than to the essential goodness of their laws, or the wisdom of their administration, for their public prosperity, and civil and individual wealth.

No doubt after all the eulogiums lavished on them by European writers, and amplified by their own; after the proposition made in congress, to declare themselves *the most enlightened and wisest* nation on the globe; these would have been audacious censures. But since a censure is no certain

indication of ill-will; since a censure even that is unjust has less inconvenience than flattery; and since at present I could not be suspected of resentment; I should have indulged myself in observations, the truth of which, though severe, would have been useful, and confessed by intelligent men: and in thus rendering the services of a disinterested friend, I should have thought myself paying a homage of admiration to that institution, which at present does more honour than any thing else to the United States, *the liberty of the press and of opinion* *.

In fine, considering this country with respect to the French emigrants, I would have examined, from my own sensations and the experience of many of my coun-

* Since Mr. Jefferson's advancement to the presidency, the federalists have incessantly loaded him with invectives in the public papers: yet such is the solidity of the principles on which he acts, that he has suffered them to say what they pleased, without his character being at all shaken in the public opinion: perhaps it is even confirmed in it.

trymen, what kind of resources and social pleasures our men of property or merchants could find in it's cities, and what kind of happiness they might enjoy in the country. My conclusions in this respect, I confess, might have appeared strange: for, after having been on the point of settling in the United States myself, I would not have advised many Frenchmen, to follow my example. My reason is, that as many advantages, as the English, Scots, Germans, and even Dutch, would enjoy from the analogy of their civil and moral system, so many obstacles would present themselves to the French; who would meet with difference of language, laws, customs, manners, and even inclinations. I say it with regret, but my researches have not led me to find in the Americans those fraternal and benevolent dispositions, with which some writers have flattered us: on the contrary I have thought, that they retain a strong tinge of the national prejudices of their mother country against us; prejudices fomented by the wars of Canada;

feebly altered by our alliance in their *insurrection*; very powerfully revived of late by declamations in congress, and by the addresses of the towns and corporations to the president Mr. J. A*** in consequence of the depredations of our privateers; and lastly encouraged even in the colleges by prizes for orations and defamatory theses * against the French. It cannot be denied too, that a contrast of habits, and forms of society, exists between the two people, by no means calculated to promote their intimate union. The Americans charge the French with levity, indiscretion, and talkativeness: and the French reproach them with a dryness of manner, a stiffness, and a taciturnity, that carry the appearance of pride and haughtiness; and such a negligence of those attentions, those civilities, on which they set a value, that they continually imagine they see in them a design to affront, or rudeness of character. In fact these complaints cannot be

* See the prizes at Princetown in 1797 and 1798.

entirely unfounded, for I have equally heard them from Englishmen and Germans. As for me, whom the Turks taught at an early age to be little nice with respect to forms, I have rather sought to investigate the causes of these, than felt their effects; and it has appeared to me, that their national incivility arose less from systematic design, than from the mutual independence, singleness, and absence of reciprocal wants, in which general circumstances have placed almost all the inhabitants of the United States.

Such is the plan of which I had drawn the sketch, and in some parts of which I had made considerable progress: but occupied by affairs both of a public and private nature, and delayed, particularly within this twelvemonth, by serious illness, I felt, that I wanted both time and strength, to bring my work to a conclusion; and I determined to publish only the view of the climate and soil, which might be detached from the rest without injury to it.

In publishing this new essay, I am far from possessing that confidence, which more

than one reader might suppose: for the splendid success of my travels in Egypt, far from affording me a certainty of obtaining the like, gives me rather an apprehension of criticism; both because the subject of the present work has in fact less variety, and is more grave and scientific; and because too much praise bestowed on one book ultimately tires out the general good will toward the author, and in all ages there will be found some of those Athenians, who throw in a shell solely because they are tired of hearing men always speak well of the poor Aristides. I have even thought sometimes, that it would have been more prudent, and more advantageous to my thirst of fame as an author, to write no more: but it does not appear to me, that having done well once is a sufficient reason for doing nothing more during our lives; and as I am indebted for most of my consolations in adversity to labour and study; as I owe the advantages of my present situation to literature and the esteem of intelligent

men; I was desirous of paying them a last tribute of gratitude, a last testimony of zeal.

On the other hand I must expect to undergo a rigid scrutiny from those who are immediately interested in the work, the Americans; most of whose writers seem to make a point of confuting the Europeans, as if from a whimsical fiction they took upon themselves to be the representatives and avengers of the Indians their predecessors; without reckoning the almost fanatic zeal, with which the loyal Antigallicans decry every thing, that comes from a nation of atheists and jacobins: but Time, that levels all things, will do justice on detraction as well as flattery; and as I have not the vanity to pretend exemption from errours, I shall at least retain the merit of having drawn attention, and excited new information, on various subjects, which might not perhaps have been thought of so soon.

The table of contents will point out the order I have followed, and the subjects on which I have treated.

In the orthography of English names I have not adopted the method of the generality of translators, who content themselves with writing the words as they find them. The English do not affix the same powers to the letters as we do, whence there is a great difference in our pronunciation of a word written in the same manner. Thus the respectable name of Washington is pronounced by them nearly as if written *Oua-chinn-tonn*; and they do not understand us, when we distort it into *Vazingueton*. I deemed it convenient for the reader therefore, to give him the true pronunciation frenchified, subjoining the English mode of spelling in a note: thus I have written *Soskouâna*, instead of Susquehannah; *Grîne*, instead of Green; *strît*, instead of street; *Ouait*, instead of White; &c. This was the practice of our writers in the beginning of the last century; and I have no aversion to ancient *ways*, when they happen to be rational *.

* This paragraph may seem superfluous to the English reader, as the French orthography has of course been

The maps I have annexed are not very minute in a political view, because this was not my object; but they are carefully executed, and for the most part new with regard to the physical information they convey, which was the particular design of my work.

omitted in the translation; but I have thought proper to insert it, as it condemns a practice that appears to me highly reprehensible, and perhaps still more common in this country than it is in France. Not only the generality of translators, but men of rank, of eminence, and even of literary reputation, when not translating from the French, give many proper names, and appellations likewise, as they have seen them spelt by French writers, though neither French, nor of French extraction, but belonging to the countries around the Nile or the Ganges, the Euxine or the Baltic. Hence they become very different words from what they ought to be in the mouth of a mere English reader, are pronounced improperly by the smatterer in French, and are rightly sounded only by the few, to whom an accurate pronunciation of the French is familiar. Every foreign word ought to be spelt either as it is by the natives themselves, or so as to represent to the reader it's proper pronunciation: surely therefore, it is very ridiculous for an Englishman, to borrow from the French a Russian or a Turkish, a Coptic or a Sanscrit word. T.

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VIEW

OF THE

CLIMATE AND SOIL

OF THE UNITED STATES OF AMERICA.

CHAP. I.

Geographical Situation of the United States, and Superficies of their Territory.

To give the most simple idea of the geographical situation of the United States, I would define their territory to be that part of North America, which is bounded, on the east, by the ocean that washes the shores of Europe and Africa; on the south, by the West Indian sea, and the gulf of Mexico; on the west, by the great river* of

* The Missisippi, a name derived from the words *metchin sipi*, which signify *great river*, in the language of the Miamis, a tribe of savages still inhabiting the country near the sources of the Miami and Wabash. It is remarkable, that the first ideas formed of the Missisippi in Canada came from this quarter, and from these savages, who annually make a

Louisiana; on the north, by that of Canada, and the five great lakes, from which it's waters are derived. In an age when the advantage of natural boundaries are so well known, we can scarcely question, that these will sooner or later form the limits of the country, as they are so distinctly marked: but a strict regard to the present state of things obliges us, to retrench from these the peninsula and coasts of the Floridas on the south, and the lower part of the course of the St. Lawrence, from lake St. Francis, as well as Nova Scotia and New Brunswic, constituting almost the whole of the country formerly possessed by the French in Lower Canada *.

This vast territory, measuring from north to south, comprises more than sixteen degrees of latitude, namely from 31° north to about 47° †.

warlike excursion, founded on an ancient grudge, against the Chactaws and Chicassaws, who dwell toward the lower part of the river.

* Louisiana, however, extending west as far as New Mexico, has lately been annexed to the United States. T.

† '*Jusques vers le* 47°:' this seems scarcely consistent with '*plus de* 16 *degrés*.' Morse gives lat. 46° for the northern boundary: but a map I have before me, by S. Dunn, corrected from the surveys of Captain Carver, places the line that divides the United States from the British territories in some parts as far north as 48° 30'. Indeed Morse's map appears to agree with this, so that he probably took 46° as the medium of the boundary line. T.

From east to west it includes upward of five and twenty degrees of longitude, which would seem to produce an immense superficies: but as the coast on the Atlantic runs diagonally from north-east to south-west, and the five lakes of Canada encroach upon it with a large sweep, reaching to the latitude of 40°, the absolute superficies will be found to be diminished more than one third.

Hutchins, the first geographer who attempted to calculate this superficies after the peace of 1783, which established the independence of the States, estimated it at a million of English miles square, or about 112000 old French leagues; which would make the territory of the United States nearly four times as much as that of France in 1789, or that of Spain and Portugal together, and almost seven times as much as that of Great Britain including Ireland. The Americans quote these comparisons with self-satisfaction; and their vanity, which is fond of anticipating the future, already measures foreigners by this scale of proportion: but if we reflect, that throughout this vast country there existed in 1801 * only five millions two hundred and fourteen thousand eight hundred and one inhabitants, of whom about

* Census published at Philadelphia the 21st of September, 1801.—*(American General Advertiser.)*

eight hundred and eighty thousand, or a sixteenth of the whole, were black slaves, and that the inhabitants are for the most part dispersed throughout the country, it will be obvious, that this extensiveness of territory is in reality a cause of weakness at present, and does not promise to be a source of union in future. Besides, the territory has been considerably amplified by Hutchins, who was unacquainted with the sources of the Missisippi, and knew but little of the north of the Ohio*; and the calculations of this geographer, though he was a very worthy man, and they were sufficient for my purpose, have not that incontestible authority, which have been allowed them by his successors, echoing the opinions of one another.

Now if we compare the United States with the countries in similar latitudes of our hemisphere, we shall find, that their southern parts, as Georgia and Carolina, correspond to Morocco and the coast of Barbary, almost to the shores of Egypt; and it is remarkable, that the mouths of the Missisippi coincide with those of the Nile, but in an opposite direction; these in the latitude of 31°, those of 29°, the Nile flowing from the south,

* I have seen in the hands of Mr. Jefferson a letter written to him by Hutchins, dated February the 11th, 1784, in which he acknowledges having committed very great mistakes in his calculations of the Northwestern Territory.

the Missisippi from the north, both with nearly the same phenomena of inundation, wealth, and excellence. The analogy of the country of America may be continued through Syria, the centre of Persia, Tibet, and the centre of China. Savannah, Tripoli, Alexandria, Gaza, Bussorah, Ispahan, Lahor, Nankin, are, within a degree, under the same parallel. The northern parts, on the other hand, as Massachusetts and New Hampshire, answer to the south of France, the centre of Italy, Turkey in Europe, the Black Sea, the Caspian, the deserts of Tatary, and the north of China: Boston and Barcelona, Ajaccio, and Rome, to which we might almost add Constantinople and Derbend, are likewise within a degree under the same latitude. From these comparisons we may infer great diversity of climate; and in fact the United States include the extremes of all the countries I have mentioned, though we observe in them a gradation with respect to their latitudes, and still more with respect to the level of the surface, in which certain peculiar characteristics lead me to distinguish four principal divisions.

The first, that of the coldest climate, includes the north-eastern states, as they are called, or New England, the natural boundary of which is traced by the southern side of Rhode-Island and

Connecticut on the ocean, and interiorly by the chain of hills, that furnishes the waters of the Delaware and Susquehannah.

The second, which I call the middle climate, applies to the central states, that is the south of New York, Pennsylvania, and Maryland, as far as the river Potowmack, or, to speak more precisely, to the Patapsco.

The third, that of the hot climate, comprises the southern states, or the flat country of Virginia, the two Carolinas, and Georgia, as far as Florida, where frost ceases to be known in the latitude of 29°.

The fourth is the climate of the western states, Tenessee, Kentucky, and the Territory northwest of the Ohio, or North-western Territory, lying behind the Alleghany chain, and on the west of the preceding states. The distinguishing characteristic of this climate is, that it is hotter, by nearly three degrees of latitude, than the corresponding country toward the Atlantic, though separated from it solely by the Alleghany mountains, as I shall mention hereafter.

CHAPTER II.

Aspect of the Country.

TO a European traveller, and more especially to one accustomed like me to the naked lands of Egypt, of Asia, and on the borders of the Mediterranean, the prominent feature of the American soil is a wild appearance of almost uninterrupted forest, which displays itself on the shores of the sea, and continues growing thicker and thicker as you proceed into the interior of the country. During the long journey I made in 1796, from the mouth of the Delaware through Pennsylvania, Maryland, Virginia, and Kentucky, to the river Wabash; thence to the north, through the North-western Territory, as far as Fort Detroit; then by the way of Lake Erie to Nigara and Albany; and the year following from Boston to Richmond in Virginia; I scarce travelled three miles together on open and cleared land. Every where I found the roads, or rather paths, bordered and overshadowed with coppices or tall trees; the silence and sameness of which, the soil in some places parched up, in others marshy, trees fallen through age, or blown down by storms, and rotting on

the ground, with the tormenting swarms of breeze-flies, moschettoes, and gnats*, do not possess all the charms, that our romance-writers dream of amid the smoke of a city in Europe. It is true, on the shores of the Atlantic this continental forest displays some openings, formed by the brackish marshes, and the cultivated fields that are continually extending round the absorbing focus of the cities. It has also considerable vacancies in the western countries, particularly from the Wabash to the Missisippi, toward the borders of Lake Erie and the river St. Lawrence, in Kentucky, and in Tenessee; where the nature of the soil, and still more the ancient and annual conflagrations of the savages, have produced spacious deserts, called savannahs by the Spaniards, and *prairies* by the Canadians, as also by the Americans, who have adopted this word. These deserts I cannot compare with those I have seen in Syria and Arabia, but rather with what are called the *steps* or deserts of Tatary; the savannahs, like the *steps*, being covered with thick shrubby plants, three or four feet high, exhibiting during summer and autumn a rich tapestry of verdure and flowers, very seldom to be seen in the bare and naked deserts of Arabia. Throughout the rest of the

* A small black fly, worse than the gnat of Europe.

United States, particularly in the mountainous parts of the interior country, from which the rivers flow in opposite directions, some to the Atlantic, others to the Missisippi, the realms of forest have experienced but slight infringements on their domain; and compared with France we may say, that the entire country is one vast wood.

If the whole of the country could be taken in at one view, we should perceive this forest to be divided into three grand districts, distinguished from each other by the kind, species, and aspect of the trees that compose it. The species of these trees, according to the remark of the Americans, indicate the nature and qualities of the soil, on which they grow.

The first of these districts, which I call the southern forest, includes the maritime parts of Virginia, of the two Carolinas, of Georgia, and of the Floridas, and extends, generally speaking, from Chesapeak Bay to the river St. Mary, on a soil of gravel and sand, occupying in breadth from eighty to a hundred and thirty miles. The whole of this space, covered with pines, firs, larches, cypresses, and other resinous trees, displays a perpetual verdure to the eye, but would not be on this account the less barren, if the sides of the rivers, land deposited by the waters, and marshes, did not intermingle

with it veins rendered highly productive by cultivation.

The second district, or middle forest, comprises the hilly part of the Carolinas and Virginia, all Pennsylvania, the south of New York, all Kentucky and the North-western Territory, as far as the river Wabash. The whole of this extent is filled with different species of the oak, beech, maple, walnut, sycamore, acacia, mulberry, plum, ash, birch, sassafras, and poplar, on the coasts of the Atlantic; and, in addition to these, on the west, the cherry-tree, horse-chesnut, papaw, magnolia, sumac, &c.; all of which indicate a productive soil, the true basis of the present and future wealth of this part of the United States. These kinds of forest trees, however, do not any where entirely exclude the resinous, which appear scattered throughout all the plains, and collected in clumps on the mountains, even of the lower order, as the chain in Virginia called the South-west: and it is a singular circumstance, that here they deviate from their customary designation of sterility, for the fat and deep red soil of this chain is extremely fertile.

The third district, or northern forest, likewise composed of pines, firs, larches, cedars, cypresses, &c., begins from the confines of the former, co-

vers the north of New York, the interior of Connecticut and the Massachusetts gives it's name to the state of Vermont*, and leaving to the deciduous forest trees only the banks of the rivers and their alluvions, extends by the way of Canada toward the north, where it soon gives way to the juniper, and the meagre shrubs thinly scattered among the deserts of the polar circle.

Such is the general aspect of the territory of the United States: an almost uninterrupted continental forest: five great lakes on the north: on the west extensive savannahs: in the centre a chain of mountains, their ridges running in a direction parallel to the seacoast, the distance of which is from fifty to a hundred and thirty miles, and sending off to the east and west rivers of longer course, of greater width, and pouring into the sea larger bodies of water, than ours in Europe; most of these rivers having cascades or falls from twenty to a hundred and forty feet in height, mouths spacious as gulfs, and on the southern coasts marshes extending above two hun-

* Formed from the French *Verd-Mont*, which the people have adopted from partiality to the French of Canada, and which is the translation of the English name, *Green-Mountain*.

(A writer in the American Museum more naturally supposes Green-Mountain to have been changed to Vermont for the sake of euphony. T.)

dred and fifty miles in length: on the north, snows remaining four or five months of the year: on a coast of three hundred leagues extent, ten or twelve cities, all built of brick, or of wood painted of different colours, and containing from ten to sixty thousand inhabitants: round these cities farm-houses, built of trunks of trees, which they call *log-houses*, in the centre of a few fields of wheat, tobacco, or indian corn; these fields separated by a kind of fence made with branches of trees instead of hedges, for the most part full of stumps of trees half burnt, or stripped of their bark, and still standing; while both houses and fields are enchased as it were in masses of forest, in which they are swallowed up, and diminish both in number and extent the farther you advance into the woods, till at length from the summits of the hills you perceive only here and there a few little brown or yellow squares on a ground of green. Add to this a fickle and variable sky, an atmosphere alternately very moist and very dry, very misty and very clear, very hot and very cold, and a temperature so changeable, that in the same day you will have spring, summer, autumn, and winter, Norwegian frost and an African sun. Figure to yourself these, and you will have a concise physical sketch of the United States.

CHAPTER III.

General Configuration.

TO conceive properly the general construction of this vast country, we must acquire a more particular knowledge of the chain of mountains, that forms it's predominant feature. This chain begins in Lower Canada, at the mouth of the river St. Lawrence, on it's southern bank, where it's capes are called by seamen Mounts Notre-Dame and Magdalen. As it proceeds up the river it gradually diverges from it, and separating the waters of it's basin toward the north-west from those of New Brunswic, Nova Scotia, and the district of Maine * to the south-east, it traces the frontier of the United States on this side as far as New Hampshire. There it takes a nearly southern direction, penetrating into the interior of Vermont under the name of the Green Mountains, dividing the basin of the river Connecticut from that of lakes Champlain and George; and after having sent off branches on that side, which repel the sources of

* Maine is at present only a district of Massachusets, but it cannot be long before it is formed into a separate state.

Hudson's river on the west and north-west, it crosses this river at West Point by a very rugged chain, which has acquired the name of the Highlands. At this place the chain may be said to experience a double interruption: in the first place being intersected by the waters; in the next because it has hitherto consisted of granite, while it's continuation is of sandstone. The head of this continuation proceeds higher up the western bank of Hudson's River to the group of the Kaats Kill Mountains, and a mass which furnishes the sources of the Delaware. From this place branches off a band of mountainous ridges, which, after having incorporated themselves with the preceding chain, extend from north-east to south-west across the states of New York, Pennsylvania, Maryland, and Virginia, increasing their distance from the sea as they proceed southward. It is a singular fact in geography, that several of these ridges intersect at right angles the course of the largest rivers of the United States that run into the Atlantic, leaving a passage for them only through breaches, which attest, that the force of the waters alone has overcome the obstacle opposed to their passage. These ridges, having continued parallel to each other till they arrive at the frontiers of Virginia and North Carolina, unite there into a knot, which I call the Alleghany Arch, be-

cause the principal chain embraces there in a curve all it's collaterals from the east. A little farther south, but still in North Carolina, a second knot unites to the Alleghany all it's collaterals from the west*, and forms a culminating point of heads of rivers; the great Kanhaway issuing from it toward the north, the Holston, or northern branch of the Tenessee, toward the west, and the Pedee, the Santee, and all the other rivers of the two Carolinas, toward the east. From this knot likewise runs off to the west a ridge of mountains, which by one bifurcation to the north-west furnishes the numerous branches of the Kentucky; and by a second, directly west, stretches under the name of the Cumberland mountains across the state of Tenessee; where it divides north and south the basin of the rivers Tenessee and Cumberland, till they open into the Ohio: while the proper Alleghany chain, left almost alone, continues it's course to the south-west, and completes the boundary of the two Carolinas and Georgia, where it receives the various names of White Oak, Great Iron, Bald, and Blue Mountains. When it reaches the angle of Georgia, it changes both it's direction and name, and proceeding due west to the Missisippi, under the names of Apalachian and Cherokee

* The ridges of Kentucky.

Mountains, it becomes the line of division between the basin of the Tenessee on the north, and the numerous rivers that run south through the Floridas into the Gulf of Mexico. The long continuity of this chain has obtained it the name of the Endless Mountains from the northern savages: the French and Spaniards, who first became acquainted with it in Florida, applied to it throughout it's whole extent the name of Apalachian, which was that of a tribe of savages, and is still retained by a considerable river of the country *: but the English and American geographers, who knew it in the north, have constantly given it the name of Alleghany, which I conceive to be the Indian word for Endless, as it is rendered by Evans, who appears to consider these terms as synonimous. I shall not attempt to dispute the preference, which the less sonorous name of Alleghany has obtained over that of Apalachian; but, for greater clearness, I shall distinguish by the name of Apalachian that branch, which, as I have observed, turns off at the angle of Georgia, and which, less steep and lofty, is divided into a number of hills and ridges, that cover the country as far as the Missisippi, terminating abruptly there in rugged precipices, called cliffs, which

* Apalachicola, a compound word, *cola* being the term for river in the Creek language.

continue from the Natchez nearly to the mouth of the Ohio. These hills do not cross the Missisippi, the opposite bank of which is low and flat, being a marsh of fifty miles breath on a medium, from it's mouth to that of the Ohio, which is seven degrees, or 480 miles distant. There the continental forest terminates, and those *steps* or savannahs begin, which extend westward to the mountains on the north of Mexico and the Stony Mountains, which, in the course of this work, I shall call the Chipiwan chain, from the name of those savages, by whom it is inhabited.

From this arrangement of the land, which I have just described, arises a sort of natural division of the United States into three long parallel countries in the direction of the coast, or from north-east to south-west.

The first of these is the eastern, lying between the ocean and the mountains, commonly called the Atlantic coast.

Another is the western, situate between the mountains and the Missisippi, and named the western or back country.

A third is that of the mountains themselves, being intermediate to the other two.

All of these countries having their climate, soil, configuration, and interiour structure, marked by

peculiar characteristics, it appears to me proper, to enter into a few particulars respecting each.

§ I. *The Atlantic Coast.*

The Atlantic coast, so called from the ocean that washes it's shores, and into which all it's rivers flow, extends from Canada to Florida; it's breadth, which varies from fifty to a hundred and eighty miles, increasing as it advances to the southward. It is the original and principal part of the states that compose the Union, which are arranged in it in the following order:

Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, and Maine

This country has but little elevation throughout it's whole extent, being flattest in the southern states, as far as Maryland, and even New Jersey, and more unequal, approaching to the mountainous in the northern states, particularly in Connecticut, Massachusetts, and Rhode Island. Long Island may be considered as a tolerably precise point of division between these two different kinds of land; for, from this island to the north, as far as the river

St. Croix*, and even to the mouth of the St. Lawrence, the shore is high, rocky, and interspersed with reefs, which are connected with the nucleus of the adjoining continent: on the contrary, proceeding from Long Island toward the south, the coast is uniformly a low shore, nearly level with the water, and entirely of sand. This sand, which announces itself a deposit of the sea, is found to a considerable distance inland, where it serves as a bed to that forest of pines, fir, and other resinous trees, of which I have spoken. As it approaches the mountains, it is mingled with a portion of clay and gravel, washed down from the neighbouring heights; and hence results a yellowish, poor, loose soil, which predominates in the middle stripe of the southern states, in Maryland, Pennsylvania, and the upper part of New Jersey, to such a degree, that these three states may be considered as vast alluvions of the rivers Potowmack, Susquehannah, Delaware, and Hudson. Farther north, particularly in Connecticut, Rhode Island, and Massachusetts, the country is furrowed with little mountains and chains, which roughen the surface of all New England properly so called. We should be almost tempted to suppose this country a prolongation of the mountainous band, did not the granitic nature

* The frontier between the United States and the English possessions in Canada.

of it's stones, and the confusion of it's ridges, distinguish it from the Alleghanies, which are formed of sandstone, and which run in a line farther west and inland.

§ II. *The Western Country, or basin of the Missisippi.*

The country to the west of the Alleghany mountains may be termed with propriety the basin of the Missisippi, as almost all the streams that irrigate it pour their waters directly or indirectly into this river. This basin is bounded on the east by the Alleghanies; on the west by the Missisippi; on the north by lakes Michigan, Erie, and Ontario; and lastly on the south by the Floridas. It is to be observed, that toward the south, in western Georgia, most of the rivers run into the Gulf of Mexico, and seem to form a distinct country; but the little extent this division would have, compared with the others, and the analogy of it's climate, it's produce, and even it's future relations, induce me to include in the western or Missisippi division all the country west of the Apalachicola, which I consider as the natural boundary of the Atlantic coast inland and to the south-west.

The states contained in the basin of the Missisippi are western Geor ia, Tenessee, Kentucky,

the great district north of the Ohio, called the North-western Territory, and some of the west parts of Virginia, Pennsylvania, and New York. The inhabitants of the Atlantic coast call the whole of this the Back Country, thus denoting their moral aspect, constantly turned toward Europe, the cradle and the focus of their thoughts and interests. It was a singular, though natural circumstance, that I had scarcely crossed the Alleghanies, before I heard the borderers of the great Kanhaway* and the Ohio give in their turn the name of Back Country to the Atlantic Coast; which shows, that their geographical situation has given their views and interests a new direction, conformable to that of the waters, which afford them means of conveyance toward the Gulf of Mexico, the chief focus of the speculative ambition of all the Americans.

If this great country be examined more minutely, we shall find, that the nature of the soil, and certain natural limits of rivers and mountains, subdivide it into three large districts, which are very distinct from each other.

The first is the country south of the Tenessee, and of the Apalachian chain, which surrounds it, from which the rivers flow into the Gulf of Mexico and the lower part of the Missisippi. In it's ma-

* A considerable river of West Virginia flowing into the Ohio.

ritime part, which is Florida, the land is perfectly flat, sandy, and barren on the seashore; marshy, forming natural meadows, as it advances inland; and thence rich and fertile, particularly on the banks of the rivers, where rice and Indian corn grow to the largest size. You will scarcely find a stone that weighs two or three pounds within thirty or forty miles of the shore. Proceeding into the country, the surface becomes more hilly, and the soil more stony: it is also less fertile, as appears by it's forest trees, the holly, pine, fir, scarlet and black oak, magnolia, red and white cedar, cypress, and a number of shrubs, indigenous to hot countries. A botanical English traveller* has made an absolute terrestrial Paradise of it; but dismissing his poetical descriptions to the shelf of sentimental romance, it would be treating this country rationally to compare it with Portugal or the coast of Barbary, and assuredly this is praising it enough.

The second district is bounded on the south by the Tenessee, on the north by the Ohio, on the east by the Alleghanies, and on the west by the Missisippi. It comprises the state of Kentucky, and that of Tenessee, which I saw established in 1796. All this space is extremely broken with

* Bartram.

little mountains, and steep ridges, most of them however covered with woods. From east to west in particular it is traversed by the chain that bears the name of Cumberland, which is thirty miles in breadth, and runs between the river of the same name and the Tenessee. In the valleys, and in what few plains there are, the soil is generally of an excellent quality, being a kind of black, rich, friable mould, from three to fifteen feet deep, and consequently of extreme fertility. The forest trees it produces, far superiour in the size of their trunks and fullness of their branches to the thin and slender trees of the Atlantic coast, are the scarlet, black, and white oak, four or five species of hickory, the tulip tree, the wild vine climbing twenty or thirty feet high, the ash, sugar-maple, acacia, sycamore, horse-chesnut, gum-tree, pine, cedar, sumach, bullace tree, persimon plum, and wild cherry, some of which are five feet and a half in diameter.

The loose and permeable nature of this soil occasions a peculiarity in the brooks and rivers, which I have seen in some part of Syria, and even in France, but no where so frequently; for throughout all Kentucky and Tenessee we are incessantly meeting with tunnels from fifty to five hundred paces in diameter, and from fifteen to fifty deep, at the bottom of which are one or more

holes or crannies, which swallow up not only the water that falls in rain in their neighbourhood, but even brooks and rivers of some magnitude. These suddenly disappear from the view of the astonished traveller, sinking into the ground amid the thickets, to finish their course in subterranean channels. The brooks and rivers in their visible course generally break away and hollow out the earth perpendicularly, till they come to a bed of calcareous stone, which serves it as a nucleus, or rather as a nearly horizontal floor. From this circumstance it follows;

1st. That almost all the streams and rivers of Kentucky and Tenessee are as it were enclosed in grooves between two perpendicular banks, from fifty feet high, like those of the Ohio, to four hundred, as the precipice of the river Kentucky at Dixon's Point:

2dly, That the country is rugged, and furrowed with deep gullies; beside being traversed with lateral branches of the Alleghany mountains, no less steep in their declivities than narrow in their summits*:

* It is on these summits, however, that the Savages, and in this they have been imitated by the Americans, formed their paths or roads. The most picturesque instance I have seen is the road traced on Gauley Ridge, in the Kanhawa

3dly, That as the land cannot be watered by art, the people of Kentucky, and in some measure those of Tenessee, already complain of drought, which increases in proportion as the country is cleared of wood, and dissipates the illusions of speculators in land, and the promises of travelling romance writers, to the sorrow of those who are misled by them.

I must not here omit a singular fact in natural history, which is well established in Kentucky, that many of the streams have become more abundant, since the woods in this neighbourhood have been cut down. I have discussed the causes of this phenomenon on the spot with witnesses deserving of credit; and it appeared to us, that in times past the leaves of the forest trees, accumulating on the ground, formed there a thick compact bed, as may still be seen where the forest subsists; and that this bed, retaining the rain-water on it's surface, gave it time to evaporate, particularly in summer, before it could penetrate the ground. At present this bed of leaves not existing, and the bosom of the earth being opened by the plough, the rain, which is enabled to sink into it, establishes in it more dur-

mountains. This ridge is not fifteen feet broad in several parts of it's length, which is near a mile, while both on the right and the left there is a steep declivity of six or seven hundred paces or more.

able and abundant reservoirs. This particular case, however, does not overturn the more general and more important doctrine, that cutting down woods, more especially on heights, in general diminishes the quantity of rain, and the springs resulting from it, by preventing the clouds from stopping and discharging their waters on the forests. Kentucky itself affords a proof of this, as well as all the other States of America; for a number of brooks are pointed out, which were never dried up fifteen years ago, and now fail every summer. Others have totally disappeared, and in New Jersey several mills have been relinquished on this account*.

Another phenomenon observed in America may perhaps be explained by means of the fact I have just mentioned. You cannot cross any forest in this continent without meeting with fallen trees; and it is remarkable, that the root is only a superficial tuft, in the shape of a mushroon, and scarcely eighteen inches deep for a tree seventy feet high. If the trees put out no tap-root, was it not that they might avail themselves of the superficial humidity

* It must be observed too, that formerly the beds of the rivers, being encumbered with trees blown down and reeds, detained their waters more, which, now they are cleaned, they suffer to run off too fast.

that covered them, and the rich mould arising from the decayed leaves, in which they found a substance much preferable to the interiour strata, that remained dry, and consequently more hard to penetrate? And now, as they have contracted this habit through a lapse of ages, ages are requisite to change it.

The third district is bounded on the south by the Ohio; on the north by the lakes of the St. Lawrence; and, as the former, on the east and west by the Alleghany mountains and the Missisippi. This space, called by the Americans the North-western Territory, does not yet reckon any established state, for want of a sufficient population*. It's surface is nearly plain, or commodiously undulated; scarcely can a mountain or a ridge two hundred yards high be pointed out in it, and througout it's west part, from the Wabash to the Missisippi, we find nothing but vast level meadows. Yet from this land flow in opposite directions a number of considerable rivers, some of which empty themselves into the Gulf of Mexico by means of the Missisippi; others into the Northern Ocean through the St. Lawrence, and others into the Atlantic by the Mohawk, Hudson, and Susquehannah. Hence it follows, that

* Sixty thousand persons are the requisite number.

the Alleghany mountains, from which the latter derive their sources, are in some respect only the breastwork of this flat, which almost equals them in height. The opposite declivities of this vast space are so gentle, that the rivers, dubious of their course, wander in sinuosities and marshes; and that in the floods of winter streams navigable by boats form a junction between the sources of the Wabash, which joins the Ohio, the Miami, which runs into Lake Erie, the Huron, which falls into the entrance of the same lake, Grand River, which flows into Lake Michigan, and several others.

Contrary to those of Kentucky, the rivers of the North-western Territory run even with the surface, not only on account of the flatness of the level, but in consequence of the clayey nature of the soil, which prevents the water from penetrating into it. This is a happy circumstance both for the agriculture and trade of this country: accordingly it begins to be preferred to Kentucky; and at some future period I conceive it will be the Flanders of the United States for corn and cattle. In 1796 I saw on the bank of the great Sciota a field of maize, the first year of it's being broken up it is true, where the plants were in general upwards of four yards high, with ears proportionably large. At the same period, a few scattered dwellings excepted, all below the Muskingum was a desert, in which

nothing was to be found but woods, marshes, and fevers. I crossed a hundred miles of this forest, from Louisville, near the rapids of the Ohio, to Fort Vincents on the Wabash, without seeing one hut, and, which surprised me much, without hearing the song of a single bird, though it was in the month of July. It terminates a little way before you reach the Wabash, whence to the Missisippi, a space of eighty miles, there are nothing but savannahs, which I have already described as Tatarian deserts. And in reality here commences an American Tatary, which has all the characters of that of Asia: hot in it's southern part, it becomes gradually cold and sterile toward the north; and in the latitude of 48° it is frozen ten months in the year, destitute of high trees, inundated with marshes, and intersected with rivers, which, in a space of near three thousand miles, have not fifty of interruptions, or carrying places. In all these respects it resembles Tatary, only wanting it's inhabitants to become horsemen; and this in fact has begun to take place within these five and twenty or thirty years, the Nihicawa or Nadowessee savages*, till that period accustomed solely to tra-

* These Nihicawas form ten or twelve tribes, settled between the Cedar Lick, and the Missouri, whence they appear originally to have come.

vel on foot, having stolen many of the Spanish horses wandering in the savannahs of the north of Mexico. In less than half a century these new Tatars may become very troublesome neighbours on the frontier of the United States; and the scheme of colonizing the borders of the Missouri and Missisippi will experience difficulties unknown to the interiour countries of the Confederation.

§ III. *The Mountain Country.*

The third parallel stripe is that line of mountainous country already mentioned, which extends from the mouth of the St. Lawrence to the confines of Georgia, divides the waters of the east and west, and forms a lofty rampart or terrace between the countries of the Atlantic and Missisippi. It's length may be estimated at a thousand miles, and it's breadth, which is very variable, pretty generally from seventy to a hundred and twenty.

This division, though comparatively very narrow, has notwithstanding great influence on the temperature of the two adjacent, from which it differs in climate, soil, and even produce. Toward the south the air is more pure, more dry, more

elastic, more healthy: toward the north, commencing with the Potowmack, mists and rain are more common, the animals are larger and more lively, and the forest trees, without being as large as those on the west, are superiour to those of the east, and excel both in elasticity.

This chain of mountains differs from ours in Europe in being longer and more regular in it's ridges than the Alps or Pyrenees, yet much less lofty. Measurements made with accuracy at various points will afford instructive and satisfactory proofs of this.

In Virginia, Otter Peak, the highest land in all the country, is only four thousand feet high *.

In the same district Mr. Jonathan Williams †, setting out from the point where the tide-water ceases to flow below Richmond, and measuring his route to the first chain of Blue Ridge, found 1150 feet elevation at Rockfish Gap. A peak near gave him 1822 feet. Farther on, beyond the town of Staunton, ascending a chain of the Alleghanies, he found 1898 feet: a second chain, that of Calf Pasture, gave him 2247: and lastly

* See Jefferson's notes on Virginia, p. 29.

† Nephew of Dr. Franklin, and author of several papers in natural philosophy inserted in the American Museum, and the Transactions of the Philosophical Society at Philadelphia.

a third, that which divides the rivers and is intersected by none, measured six miles south-west of Red Spring, gave him 2706 feet.

Consequently the Alleghanies, which I have crossed myself in this part, where they appeared to me to be loftiest, are not more than 2706 feet, or 405 toises, above the level of the ocean. Blue Ridge, at the opening of Harper's Ferry, below the mouth of the river Shenando, appeared to me to have nearly the same height as at Rockfish Gap; accordingly it's mean height may be estimated at 1150 feet, that is less than half the height of the Alleghanies in Virginia.

In Maryland, George Gilpin and James Smith took the following levels in 1789:

On the river Potowmack, from the limits of the tide, that is to say from the rapids of Georgetown to the mouth of Savage River, in an extent of 218 miles, the ascent is 1160 feet: in this account the rapids of Georgetown are taken at 37 feet, and the great fall of Matilda, including it's rapids, which extend three miles above it, at 76 feet.

From the mouth of Savage River to the place called Moses Williams on the summit of the Alleghanies, in a space of eight miles three quarters, the ascent is 2097 feet, making in the whole 3257.

In Pennsylvania the height of the Alleghanies above the flat country, according to Dr. Rush, is only 1300 feet; and in fact travellers observe, that we arrive at them by a series of gentle and gradual ascents, which are scarcely noticed.

In the state of New York, the highest peak of the Kaats Kill Mountains, measured in 1798 by Peter de la Bigarre *, was found to be 3549 feet above the level of Hudson's River, in which the tide flows ten miles above Albany.

In Vermont, Killington peak, measured by Samuel Williams as the loftiest of all the chain, is only 3454 feet †.

Lastly the White Mountains in New Hampshire, which are visible thirty leagues at sea, and which Mr. Belknap estimates from the accounts of travellers at 10000 feet ‡, are reckoned by S.

* Transactions of the Society of New York, Part II, p. 128.

† See History of Vermont, by S. Williams, p. 23. It is in one volume 8vo, printed at Walpole, in New Hampshire, 1794. The author observes, that in these latitudes the region of constant frost is at 8066 feet. Mr. S. Williams, who must not be confounded with Jonathan, was formerly professor of mathematics at Cambridge, near Boston, and a clergyman, but at present lives retired in the state of Vermont.

‡ History of New Hampshire by Belknap, Vol. III, p. 49. See also S. Williams's work, p. 23.

Williams, who assigns his reasons, at 7800 feet only.

The Alleghany chain therefore can be considered only as a rampart of the mean height of 2000 or 2400 feet, about 350 or 400 toises, which differs altogether from the grand chains of our globe, as for instance

the Alps, estimated at -	1500 toises,
the Pyrenees - -	1350,
the Andes - - -	2500,
Libanus - - -	1453;

and it is obvious, that this circumstance must have considerable influence on the meteorology of the United States and the whole of their continent, as I shall show more particularly hereafter.

All European travellers remark with surprise, that the American mountains have more regularity in their direction, greater continuity in their ridges, and less inequality in the line of their summits, than the mountains of our continent. These characteristics are particularly striking in Virginia and Maryland in the chain called Blue Ridge. This chain, which I have traversed or pursued the direction of from the frontier of Pennsylvania to James River, always exhibited to me the appearance of a terrace elevated ten or twelve hundred feet above the plain, with a very steep ascent, and a summit so even, that we

scarcely perceive it's undulations, or the few gaps that serve for passages across it. The base of this mass is only from four to six miles broad. Approaching the north the height of this chain, as well as of those that are parallel to it, decreases; and as some of it's ramifications have occasioned in Pennsylvania a confusion of names, by which even geographers are perplexed, I will endeavour in the first place to elucidate them.

In Virginia three principal well-marked ridges are clearly to be distinguished.

1st, Blue Ridge, situate most easterly, which derives it's name from it's blueish appearance at a distance to those who come from the flat maritime country. It bears the name of South Mountain in the maps of Evans and other geographers, without any good reason being assignable for the term. Indeed the mountains of the United States in general, named at hap hazard by the colonists of each district, have but unmeaning and frequently whimsical names. However this may be with respect to Blue Ridge, it branches off from the grand arch or knot of the Alleghanies, and is even the most direct prolongation of that chain, as you come from the south: it crosses James River below the junction of it's two superiour branches, the Potowmack below the Shenando, the Susquehannah below Harrisburg, and travel-

lers observe, that the bed of this river, navigable so far on a calcareous bottom, becomes impassable in consequence of the rocks and sandstone of Blue Ridge. In Pennsylvania this ridge, less continuous and of inferiour elevation, assumes in different districts the various names of Trent, Flying, and Oley Hills; but it is nevertheless the same branch, which crosses the Schuylkill below Reading, the Delaware below it's western branch and the town of Easton, and proceeds to lose itself in the Kaats Kill group towards the banks of Hudson's River.

The second chain, called North Mountain with as little reason as the preceding is named South, branches off likewise from the grand arch of the Alleghanies, and running parallel with Blue Ridge, but west of it, crosses the upper branches of James River twelve or fourteen miles above their junction, and the Potowmack four and twenty miles above the Shenando; but when it reaches the west branches of Conegocheague Creek, it divides into several ramifications, which render it's remaining part doubtful. Some geographers look on the Tuscarora chain, though divergent, as it's continuation; which, after having crossed the river Juniata, loses itself in the rocky and marshy deserts north-east of the Susquehannah. Others follow North Mountain in the chain of Kittatinny, which, continuing in a more direct line, runs parallel with

Blue Ridge as far as the Delaware, which it passes above it's west branch and the town of Nazareth, then proceeding along the east bank of that river, and terminating with the branches of Blue Ridge in the Kaats Kill group and the mountains that separate the sources of the Delaware from the course of Hudson's River.

In Pennsylvania Blue Ridge and North Mountain are pretty commonly confounded together, because, as the characteristics of the two are not very distinctly marked, each district applies the epithet of Blue to it's most elevated chain, and a particular name to each different ramification: but the geographical continuity of North Mountain in the Kittatinny, and of Blue Ridge in the Flying and Oley Hills, as I have traced them, appears to me best established by the general direction of these chains, by the nature of their stones, and by their concurrence in forming a calcareous valley, which is prolonged uninterruptedly between them from the Delaware and the townships of Easton and Nazareth to the sources of the Shenando beyond Staunton*.

* It is not without a careful examination of this question, that I differ from the projection of Mr. Arrowsmith, who, totally neglecting the ridge of Oley Hills and Flying Hills, turns off the chain of Blue Ridge into the Kittatinny below Harrisburg. This geographer may have had notes made by

The third principal chain, that of the Alleghanies properly so called, is the highest ridge to the west, which, separating all the rivers, without being cut by any one, has properly received the name of Endless. This chain, taking it at it's southern extremity, comes from the angle of Georgia and Carolina, where it receives the various names of White Oak, Great Iron, Bald, and even Blue Mountains. There it sends off to the west some branches of the river Tenessee, and to the east the rivers of the two Carolinas, of which it forms the western frontier. On reaching Virginia it forms the arch I have mentioned, by bending toward the north-west, and enveloping the preceding ridges: it then resumes it's course north-

travellers, who, influenced by the vulgar opinion of the settlers in Pennsylvania, and by the name of Blue Ridge, which they give in some districts to the Kittatinny, had adopted this system. But in addition to the authorities of Evans, Fry, and Jefferson, which I deem of superiour weight, I have myself seen, when crossing the Susquehannah on the road from York to Lancaster, a chain a mile above the ferry at Columbia, that is evidently a prolongation of Blue Ridge, which may be seen for a long while on the west of this road, more or less distant. This chain, equal in height on both banks, leaves the river only a narrow passage over a rapid; and every thing attests, that the water has forced it's way like that of the Potowmack below Harper's Ferry.—It continues it's course north-north-east.—The bed of the river, at the ferry near Columbia, is calcareous.

north-east, and sends to the Ohio the waters of the Great Kanhaway and Monongahela, to the Atlantic those of the rivers James, Potowmack, Susquehannah, &c.; but toward the sources of the western branch of the latter it divides into several ramifications, the most considerable of which proceed to the eastward, and, crossing all the streams of the Susquehannah, terminate in the Kaats Kill Mountains, and at the sources of the Delaware and Hudson; while other ramifications to the east surround the sources of the Susquehannah itself, and proceed by Tioga to furnish those of the lakes of the Iroquois or Genessee country: unless indeed it should be thought proper to assign these branches to a ridge farther west, which, under the names of Gauley, Laurel, and Chesnut Ridge, likewise terminates in this country.

Beside the three principal chains of Virginia, which I have just described, there are still several intermediate ridges, which frequently equal them in height, steepness, and continuity; as those of Calfpasture, Cowpasture, and Jackson, which I crossed in travelling to Staunton by the way of Green Briar. In the latter mountains are thermal waters of different qualities, celebrated in Virginia for their virtues, and known by the names of Warm Spring, Hot Spring, Red Spring, &c. Warm Spring, which I have visited, is an ammo-

niacal sulphurous water, about 20° [77° F.] of heat. It rises in the bottom of a deep valley, shaped like an inverted cone, which has every indication of having been the crater of a volcano now extinct.

West of the Alleghanies, toward the basin of the Ohio, there are likewise several remarkable ridges. I crossed one known by the name of Reynick* and High Ballantines, eight miles west of the town or village of Green Briar, and it appeared to me as lofty as Blue Ridge, but much broader. From the plain on it's summit I saw a number of others toward the south-west and north-east. Fifteen miles farther on I entered by a winding road into a series of other chains, eight or ten of which I crossed in the space of thirty-eight miles, till I reached Gauley, the highest and steepest of all, and the narrowest on it's ridge. This whole space of thirty-eight miles I consider as one lofty terrace. Beyond the Gauley Hills we cross no other high chain, except with the course of the rivers, the direction and often indeed the bed of which we follow; but I have observed, that the bed of the Great Kanhaway often makes it's way through one of the roughest countries I

* The name of the earliest or principal settler on the road. Almost all the names of places in the United States have a similar origin.

ever saw. Many of these ridges direct their course to the Ohio, and we shall see, that some must have crossed it. This Gauley Ridge commences with the sources of the Great Kanhaway to the south-west of the Alleghany arch, and under the names of Laurel Hill and Chesnut Ridge proceeds northward, to terminate at the head of the Susquehannah. Southward the settlers in Kentucky and Tenessee have extended the name of Great Laurel to the principal branch, that separates Kentucky from Virginia; and have given the name of Cumberland to it's continuation, which accompanies and bounds Cumberland River as far as it's mouth. I have not sufficient documents with respect to this part. The government of the United States has in it's power a very simple mean of procuring itself a complete collection: this is, to oblige all the surveyors, by a statute of the college of William and Mary at Williamsburg, where they undergo their examination, and receive their patent, to add topographical details to the barren accounts of their measurements. Thus in a few years a complete system of the mountains and rivers would be obtained without expense.

It remains for me to give what information I could procure respecting the internal structure of these mountains, that is the nature and arrangement of the stony strata that form their nucleus.

Incomplete as these may be, I have reason to presume they will not be uninteresting, were it merely for their novelty, their connexion, and the pains I have taken to give satisfaction to those readers, who attach to the science of physical geography all the importance it merits. To him who knows how to observe facts, and deduce from them judicious conclusions, the structure of our globe is a book of much superiour information and authenticity with respect to the history of the revolutions it has undergone, than the traditions of ignorant savages, vague and destitute of authority at the commencement, afterwards adopted by civilized nations, and formed into established systems.

CHAPTER IV.

Internal Structure of the Soil.

DURING my various journies in the United States I was very attentive in collecting specimens of the strata and shelves of rock, that I found most predominant, and most widely diffused, as it was a subject that I felt particularly interesting. As I sometimes travelled on foot for several days

together, I could not load myself with large pieces; but those I collected were sufficient for my purpose, and all taken together, or compared with those which foreign travellers showed me or gave me at Philadelphia, enabled me to determine on my return to Paris, with the assistance of some mineralogical friends, the genus and species of their parent strata, and to methodize a kind of physical geography of the United States*.

Judging from these documents, I think I can affirm with sufficient precision, that the extensive country comprised between the Atlantic and the Missisippi is divided into five regions of different nature, which may be classed as follows:

§ I. *Granitic Region.*

The first, which is that of granites, is bounded by the Atlantic Ocean, reckoning from Long Island to the mouth of the St. Laurence; thence by a line proceeding up that river to Lake Ontario, or rather to Kingston, formerly Frontenac, and the place called Thousand Isles, passing by the sources and course of the Mohawk to Hudson's River, along which it returns to the point of departure, Long Island. Throughout the whole

* These specimens may be seen in the cabinet of cit. la Métherie; the editor of the *Journal de Physique*.

of this space the soil rests on beds of granite, which form the skeletons of the mountains, and admit beds of a different nature only as exceptions. The granite exposes itself to view in all the environs of the city of New York: it is the nucleus of Long Island, where sands have been accumulated round it by the waves of the sea: and it may be traced without interruption on all the coast of Connecticut, Rhode Island, and Massachusetts, excepting Cape Cod, which is formed of sand brought by the great current of the Gulf of Mexico and the Bahamas*, which I shall have occasion to mention hereafter. The granite extends likewise along the coast of New Hampshire and Maine, where it is mixed with some sandstone, and likewise with limestone, with which Boston is supplied from Maine. It composes the numerous shoals on the coast of Nova Scotia, and the nucleus of the mountains called Notre Dame and Magdalen, on the right of the mouth of the St. Lawrence. The banks of this river are in general schistous, but this does not prevent the granite from showing itself frequently in detached masses, and in shoals fixed in the bed of the river. It is found again throughout the environs of Quebec; in the mass of rock, that supports it's cita-

* Called by the English the Gulf Stream.

del; in the tolerably lofty mountains north-west of the city; and lastly under the Falls of Montmorenci, a small river, which comes from the north, and precipitates itself into the St. Lawrence down a precipice of a hundred and eighty feet. The immediate bed of this cascade is a horizontal calcareous shelf, of a black gray colour, and of the kind termed primitive or crystallized: but it is supported by strata of brown gray granite, of a very close grain, and nearly perpendicular to the horizon. Wherever these strata show themselves along the St. Lawrence, they are more or less inclined to the horizon, never parallel with it. A granite of a red, black, and gray colour abounds on the right bank of the river, opposite Quebec, resembling that of the State-house at Boston, which was drawn from the neighbourhood of the city; both being similar to the block that was brought from Lake Ladoga to Petersburg, to serve as a pedestal for the statue of Peter I. The isle in which stands the city of Montreal is calcareous; but all the shore about it exhibits stones of rounded granite, brought down, no doubt, from the adjacent heights. The summit of Mount Bel-œil is of granite, as is the chain of the White Mountains in New Hampshire, to which it may be said to belong. The branches in New England are likewise of granite, except the environs of Mid-

dleton and Worcester, which are of sandstone. I am informed, that the west branch of the Green Mountains, and the greater part of Lake Champlain, which it skirts, are calcareous, though the rocks of Ticonderoga are of sandstone; and the east branch, which traverses the state of Vermont, is of granite. It appears then, that the granite traverses Lake George, or the isthmus that separates it from Hudson's River, to ascend to the sources of this and Black River; thence it proceeds as far as the St. Lawrence at Thousand Isles and Kingston, where it is always found of a reddish hue, formed in large crystals, and surcharged with feldt-spar. Mr. Alexander Mackenzie, in his Travels lately published*, furnishes the means of tracing it's continuations much farther in the north part of this continent. This respectable traveller, with whose merits I had an opportunity of being personally acquainted at Philadelphia, observes, vol. iii, p. 335, that 'a dull gray granite is found throughout all the country from Lake Winnipeg to Hudson's Bay; and that he has even been informed, it extends in like manner from Hudson's Bay to the coast of Labrador.'

* Travels in the interiour of North America, by Alexander Mackenzie, translated by Castera, 3 vols. 8vo.

Consequently all the North of America, as far as Long Island, is a granitic country.

A few lines before Mr. Mackenzie had said, that rocks of the nature of limestone, disposed in thin and nearly horizontal strata, and of a pretty soft texture, were perceptible on the east shore of Lake Dauphin, and on the shores of the lakes Beaver, Cedar, Winnipeg, and Superiour, as well as in the beds of the rivers, that traverse the long line of these lakes. He adds: 'what is also very remarkable is, that in the narrowest part of Lake Winnipeg, where it is not more than two miles over, the west shore is skirted by calcareous rocks of this same quality, in cliffs thirty feet high; while on the opposite shore, that on the east, there are rocks still higher of the granite above-mentioned.'

From the whole of his description, which I have abridged, it follows, that the region of these calcareous stones, which we shall find prevailing every where west of the Alleghanies, extends in a line north-west beyond Lake Michigan as far as the sources of the Missisippi, and thence to those of the Saskachawan, thus joining the grand chain of the Stony or Chipewan Mountains, which is itself a continuation of the cordillera of the Andes: 'and it must be observed,' says Mr. Mackenzie, 'that all the great lakes of North America are

placed in the line of contact between these vast chains of granite and of limestone.' This is a fact in physics, that merits the attention of the philosophical geologist.

Returning to the southward from the river St. Lawrence, granite prevails throughout Steuben county, as far as the Mohawk*, the course of which it accompanies, though I cannot affirm, that it crosses it, except at it's little fall above Skenectady. We see none at it's great fall, that of Cohoz, the bed of which is a serpentine, of the same species as I found at Monticello† in Virginia, a species very widely diffused throughout the whole of the chain called South-west Mountain; but it reappears immediately below Albany, on the east bank of Hudson's River, which constantly flows between two rugged declivities, covered with thin copses of oaks and firs. Twenty miles below Poughkeepsie begin rocky, barren ridges, in a transverse direction, which recalled to my remembrance Corsica and the Vivarais. The road is broken by these for the space of five and twenty

* It appears, that the bed of the Mohawk separates the granitic from the sandstone country.

† The habitation of Mr. Jefferson in Virginia, on the chain called South-west Mountain, though it ought rather to be named Red Ridge, on account of it's argillaceous soil of this colour, perfectly resembling that of Aleppo in Syria.

miles, and every where they display blocks of grayish granite, disposed in shelves inclined to the horizon at angles of 45° or 50°, and covered with mosses, firs, and other stunted evergreens. The river runs between similar banks as far as West Point, where it has forced the barrier of rocks opposed to it's current by the last of these transverse ridges, at the foot of which the Highlands terminate, and are succeeded by the Lowlands, or maritime country.

In the latter, forming a plain as far as New York, the left bank of the river is continually exhibiting ledges of reddish or grayish granite, projecting out of the ground in such a manner, as leads us to presume they run very deep into it*.

The mineralogical researches undertaken by a society of physicians at New York* sufficiently prove, that the granite traverses the territory of that city, and the rivers Hudson and Harlem, and extends to all the first rank of hills in New Jersey. The direction of these ledges, particularly from the boundaries of Connecticut, is from north-east to south-west, being parallel to the coast; their inclination is nearly vertical to the horizon, and their chain is supposed to continue as far as Ver-

* See the Medical Repository, Vol. I, No. 3, New York, 1797.

mont. Dr. Mitchill, travelling for the society, observes, in the account of these facts transmitted to it by him in 1797, that from the sea to West Point, that is in the low lands formed by alluvions from the sea, the granite is mingled with quartz, feldt-spar, schorl, mica, and garnet, sometimes in lumps, at others in flakes: that the granitic region terminates abruptly on the bank of the Hudson, at Polliples Island, opposite a large rock in Fishkill, twenty miles below Poughkeepsie; and that forty rods farther on commences a schistous region, the schist coming out of the ground on the bank of the river, as if it there formed a bed to the granite. He conjectures, that this schist reaches as far as Albany, and forms the ledge down which the fall of Cohoz precipitates itself: but this cannot be admitted, unless he gives the name of schist to a serpentine, a specimen of which he has sent me, and which is itself the immediate bed of the fall. This schist, adds Dr. Mitchill, serves likewise as a bed to the calcareous strata scattered throughout the country. He mentions a block of this kind a mile from Claverack, and four miles from the city of Hudson on the river of the same name, presenting a prominent mass eight hundred acres in superficies, filled with shells, none resembling which are to be found in the nearest sea, distant a hundred and forty miles.

Dr. Mitchill mentions other calcareous ledges near New York, at the place where the streams separate, some running into the Hudson, others into the Sound, or that arm of the sea that faces Long Island. He imagines, that at a period unknown in history the ocean covered this ground, and his opinion is supported by all the facts he mentions respecting the Kaats Kill Mountains.

These mountains he has found to consist of the same sandstone as Blue Ridge, of which he deems them a continuation; and this fact fixes on this side the reciprocal limit of the granite, and of the sandstone that composes a second region of great extent, as we shall presently see. This sandstone at Kaats Kill is supported by a bed of friable slate, which gives out in the fire a strong smell of bitumen, and exhibits strata, in some places broken and confused, in others inclined to the horizon in angles from 50° to 80°. Dr. Mitchill first imagined these mountains to be of primitive formation, because the granites and sandstones contained no fossils; but he soon found contrary indications: as, 1st, the aspect of rocks containing pebbles or small stones of red and white quartz, sandstone, and red jasper, all evidently rolled and worn by the waters: 2dly, horizontal and very regular strata of these rocks: 3dly, fossile shells unknown in these seas, the clam and scallop ex-

cepted, and found on their summits in an argillaceous or in a siliceous bed. All these circumstances led him to conceive in this disposition of the ground three principal epochs of it's formation: the first, that which deposited the sands; the second, that of the waters by which they were rolled and triturated; the third, that of the existence of the living shell-fish.

Lastly he remarks, that the steep side of these mountains faces the west, while the declivity on the east is gentle, without another answering to it. Out of the granitic region I have just described some exceptions exist, the most remarkable of which are, 1st, the mountains between Harrisburg and Sunbury on the Susquehannah, composed in great part of granite*; 2dly, a vein of talky granite, or Muscovy glass, of which I shall speak in § IV; 3dly, numerous blocks at the foot of the south-west chain in Virginia, particularly near Milton on the Rivannah.

§ II. *Region of Sandstone.*

The sandstone of Kaats Kill forms the distinguishing character of the second region or diversity of soil, which comprises all the mountainous

* Liancourt's Travels, Vol. I.

country of Blue Ridge, Alleghany, and Laurel Hill the sources of the great Kanhaway, the knot or arch of the Alleghanies, and in general all their chain to the south as far as the angle of Georgia and the Apalachians. I lose the traces of it to the west in the state of Tenessee and the chain of Cumberland, and cannot assign it's contiguity to the calcareous region with precision. In the north and north-east it's limits appear to be the sources of the Susquehannah, even those of the lakes of Genessee, and in general the right banks of the Mohawk and Hudson. Dr. Smith Barton of Philadelphia, who on his return from a journey to Niagara, in 1797, crossed the whole of upper Pennsylvania, never lost sight of sandstone from Tioga to within nine miles of Nazareth. Mr. Guillemard, in his journey from Philadelphia to Pittsburg by the way of Sunbury, found it every where till he came to the west of the Alleghanies, called in that district Blue Hills, except in a few calcareous vallies, of which I shall speak*. Lastly in Virginia, from Charlot-

* The land of all the upper Susquehannah is mingled with schists, stones, gneiss, schorl, and feldt-spar, intersected by a number of ridges of little elevation, ascending by steps to the Alleghanies, where sandstone predominates. There are also veins of basaltes, the produce and proofs of ancient volcanoes. The trees are universally stunted, and vegetate weakly.—(Note by Mr. Guillemard.)

tesville to the river Gauley, I myself found it in abundance on the ten or twelve chains I crossed successively, excepting likewise the calcareous valleys of Staunton and Green Briar. Sometimes the sandstone admits the mixture of a milky white quartz, called arrowstone, much of which I found on Blue Ridge going from Frederick Town to Harper's Ferry; and sometimes also with gray quartz, which is the nucleus of Blue Ridge, at the gap made in it by the Potowmack below Harper's Ferry. Some of the rocks of this gap are of granite, but these are few in number.

These mountains of sandstone are not so bare, as the nature of this stone might lead us to suppose. I found their loftiest summits in Virginia between the rivers of Green Briar and Gauley covered with fine trees, and tall perennial plants, growing in the excellent black Kentucky mould, which is the distinguishing characteristic of the Western country. The lofty region, that extends above Fort Cumberland beyond the sources of the Potowmack to those of the Yohogany, and which is known by the name of Green Glades, is a real Switzerland, very rich in pastures, the vigour of which is maintained throughout the summer by clouds, mists, and drizzling rain, which at this season are wanting in the plain. This advantage is owing to an elevation of about 700 yards, as was before observed; but it does not extend

to the chains of Gauley and Laurel Hill, which are rocky and dry. Evans, the geographer, estimates the parts of these susceptible of cultivation only at a tenth of the whole, and his numerous surveys give great weight to his opinion. These parts adapted to agriculture are found only in the valleys, which, as in other places, being enriched by the earth washed down from the mountains, are commonly the most fertile.

Toward the north-west, that is on the side of the lakes of Genessee, Ontario, and Erie, the sandstone terminates in a region of slaty schist and blue marle, which is pretty extensive, for it appears to form the bed of these lakes, as appears from soundings taken in them, and the stones at their bottom and in their banks. They extend even over the beds of coal in West Pennsylvania. This marle is full of fossil shells. Ledges of these schists are found again at Niagara, and, as I have said, all along the St. Lawrence, as far as Quebec. We have seen, too, that they pave the bed of the upper part of the Hudson. These are their most extensive known domains; elsewhere they are seen only in small patches.

Beside this vast region of sandstone, which I have just described, some districts of the same nature may be mentioned dispersed through the granitic and calcareous regions; but there in turn

they form exceptions. Such is that of the county of Worcester in Massachusetts, the most extensive of the kind known. This cannot be referred to the Alleghanies, unless it's continuity across the rivers and country of Connecticut and the Hudson could be shown.

§ III. *Calcareous Region.*

The third region, that of calcareous earth, includes all the Western or Back Country, lying behind the Alleghany mountains, and extends northwest, according to the information of Mr. Mackenzie, across the rivers and lakes to the sources of the Sakatchie, and the chain of the Chipewan mountains. All of this country that I am acquainted with from the Tenessee to the St. Lawrence, between the mountains and the Missisippi, has for it's nucleus an immense stratum of limestone, disposed nearly in a horizontal direction, in laminæ of one or more inches thick, of a close smooth grain, and generally of a gray colour. In the north the limestone is of the crystallized kind, called primitive. This stratum has immediately under it in some places a bed of clay, in others of gravel, and above it, on the surface of the ground, a stratum of excellent black mould, deepest in the

bottoms, where it is sometimes found fifteen feet thick, and shallowest on the risings and heights, where it occasionally does not exceed six or eight inches. This circumstance, as well as the laminated structure of the stone, evidently indicate an anteriour operation of the waters of the ocean.

In the country about Pittsburg on the Ohio, in the county of Green Briar on the Kanhaway, and throughout Kentucky, this fundamental stratum is found on boring; and I have seen it bare in the beds of all the rivers and brooks of Kentucky, from the Kanhaway to the falls or rapids of the Ohio near Louisville. On the road from Cincinnati to Lake Erie, I found it serving as a floor to all the bed of the river aux Glaises and the Miami of the Lakes; it appears, that the lake itself has a bottom of blackish schist, but among it's specimens we find a great deal of limestone, and it is likewise a stratum of limestone that runs under the St. Lawrence at the Fall of Niagara, and extending thence into the Genessee country, appears to accompany the bed of the St. Lawrence as far as Quebec. It is true, however, that throughout this part of the north the limestone is of the kind called primitive and crystallized, as I have found by the specimens brought up by the settlers in Genessee when sinking wells.

The rupture and displacement of these strata occasion the gulfs and cavities, of which I have spo-

ken in the first section of the third chapter, where the torrents occasioned by rain, and even the rivers themselves, are swallowed up. I have seen curious instances of this at Green Briar in Virginia, and at Sinking Spring in Genessee, where a spring rises to the bottom of a cavity, and at the distance of six feet again sinks into the earth. These subterranean currents of water likewise produce the winds in some caverns, as that mentioned by Mr. Jefferson in the chain of Calf Pasture*.

From Louisville to White River, where it abruptly terminates, I have likewise found all the rivers and brooks flowing over the bare limestone stratum of Kentucky. Some American travellers, on seeing my specimens, have assured me, that the Holston, or north branch of the Tenessee, had a similar bed. Respecting the soil that extends beyond it into Georgia and Florida, to my great regret I have been unable to obtain any authentic information.

At Louisville the first superficial stratum on the high bank of the river is a black mould three feet thick. Under this mould is a stratum of poor sand, without shells, fourteen or fifteen feet in thickness; then another stratum of sand with shells, from six to ten inches; and lastly a pretty coarse gravel, down to the bottom of the river, which is twenty five feet deep.

* See Jefferson's notes on Virginia, p. 63.

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Fig. 3. See page 83.

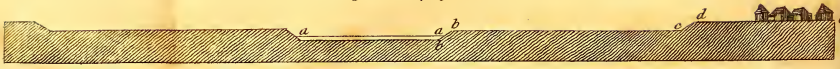
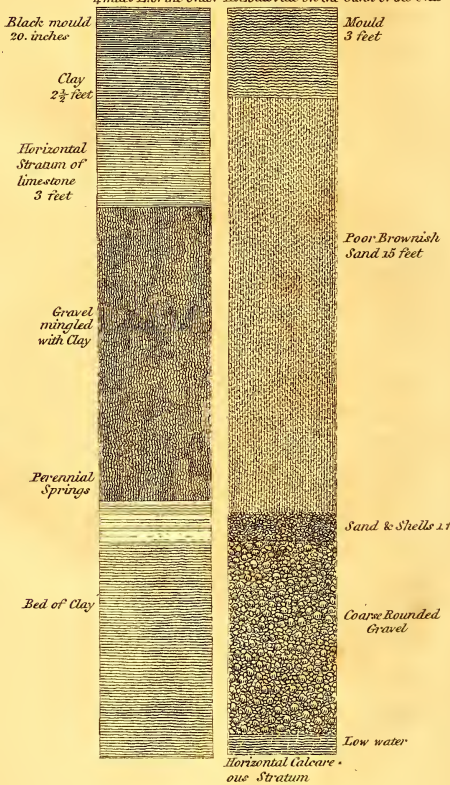


Fig. 2. P. 68.

Fig. 1. Page 58, 59.
Borings in the Soil
4 miles E. of the Ohio. At Louisville on the bank of the Ohio



S. Neale sculp. Strand.

Four miles east of Louisville*, advancing into the country, the first superficial stratum of mould is not above twenty inches thick; and farther on, four miles from Francfort†, it is not more than fifteeen. In both these places there is beneath it a stratum of clay, from two to three feet thick, which is not found near the river. Under this clay is the calcareous stratum, which must be perforated with much labour to reach a bed of gravel and clay, in which are found the springs that furnish the wells with a constant supply of water.

At the place I mentioned near Louisville, the stratum is three feet thick, and the springs that never dry up are found at the depth of eighteen feet from the surface. In other places the thickness of the stratum appears greater. The rocks that form the falls or rapids of the Ohio below Louisville belong to this great limestone stratum, on the surface of which many petrifactions have been collected at low water, but they were brought thither, and not imbedded in it. I never saw any fossils encrusted in the substance of the great subterranean stratum, a fact at which I was the more astonished, as, when at the seat of judge Innes near Francfort, walking with him on the summit of a chain about a hundred feet above the level of the

* At the seat of Mr. Thompson.

† At the seat of judge Innes.

little river Elkhorn, which pierces it, we found in the wood a number of large stones, entirely made up of fossil shells. At Cincinnati, on the second bank of the Ohio, I found more such stones full of shells: and doctor Barton collected similar stones on the heights of Onondago, in the state of New York, at the distance of near six hundred miles, with this difference only, that his are of a blue slate colour, mine a violet red*.

* On my return to Paris, I submitted these shells to the examination of one of our most skilful naturalists in this branch of science, Mr. Lamarck, and I cannot better satisfy the curiosity of my readers, than by communicating to them his sentiments on the subject:

'SIR,

'I have examined with the utmost care the three specimens of fossils, that you have transmitted to me, and which you collected in North America.

'In each of them I very clearly perceive fossil terebratulæ * heaped together without any order. These terebratulæ are almost all of the division of those that are striated longitudinally above and below, as the terebratula described by Linneus under the name of anomia dorsata.

'Of these fossil shells we see only the inner mould, that is the stony matter, with which the inside of these shells was filled during their long abode in the earth. On several of them, however, the whitish portions of the shell itself still remain.

* A new genus introduced in my *Système des Animaux sans Vertebres*, "System of Animals without Backbones," p. 138, being separated from Linneus's genus anomia.

Beside the Western Territory, and the region I have just described, there exist only two calcareous districts, that are of sufficient extent to be worth mentioning as exceptions: one in the long valley formed by the chains of Blue Ridge and North Mountain, from the Delaware above Easton and Bethlehem to the sources of the river Shenando, and even beyond James River, to the

'In the specimen from Cincinnati three sorts of fossil shells are distinctly seen: a species of terebratula with large striæ, approaching to that figured in the new Encyclopédie, pl. 241, fol. 3; another species not striated, but punctated, pearly, and eared; and a bivalve shell thinly furnished with spines, the genus of which I cannot ascertain, as I am unable to examine the hinge.

'In the specimen found in Kentucky, a hundred feet above the bed of the waters, I observed striated terebratulæ of different ages, of a species that appears to come near that figured in the new Encyclopédie, pl. 242, fol. 1, it's striæ being finer and more numerous than in the terebratula of the preceding specimen, and it's upper or smaller valve is flattened. This specimen likewise contains a fragment of a belemnite.

'In the third specimen, that from the heights west of Onondago, I perceive various fragments of two striated terebratulæ, still different from those of the preceding specimens. One of them, inclined to the triangular figure, has a channel on the back of the large valve, and approaches very near that represented in pl. 244, fol. 7, of the new Encyclopédie. The other terebratula is large, almost as flat as a pecten or scallop; but it's fragments are so incomplete,

great arch of the Alleghanies; for the county of Botetourt, which occupies the part last mentioned, is called the Lime County, in consequence of it's supplying with lime all the country east of Blue Ridge, where there is none. Rockbridge too is in great part calcareous, as well as all the country from the Shenando to the Potowmack.

that it is impossible to mark it's characters, and ascertain the relation it bears to other species.

'*Note.* From a consideration of these three specimens, it appears evident to me, that the regions of North America, where they were collected, once formed a part of the bottom of the sea*, or at least that they at present display to view that portion of their soil, which anciently formed a part of the bed of the ocean, and not of the shores: for the fossils now found there are ocean shells (see my *Hydrogéologie*, pp. 64, 70, and 71), which, as the gryphytes, ammonites (cornua ammonis), orthoceratites, belemnites, encrinites, &c., live uniformly in the great depths of the ocean, and never on it's shores. Accordingly most of these shells and polypi are known only in the fossil state.

'Your observations, sir, decide the nature of the fossils, which the interiour part of North America now displays to view, and apparently we should search in vain among them for littoral shells. 'LAMARCK.'

* This opinion is strengthened by the numerous brine-springs, with which the whole Western Territory abounds. They are there called by the name of *licks*, as may be seen on all the maps of Kentucky. The richest is near lake Oneida, and contains an eighteenth part of it's weight of salt. The northern seas contain only a thirty-second, and those of the tropics about a twelfth. It is remarkable, that these salt springs are rare on the Atlantic Coast.—*Note of the Author.*

Another part of the valley, that which extends from the Potowmack to the Susquehannah, comprises the basin of the rivers Great Connegocheague and Conedogwinet, in which are the territories of Chambersburg, Shippensburg, and Carlisle, celebrated for their fertility. A third portion, reaching from the Susquehannah to the Delaware, occupies the basin of the river Swatara; traverses, with some interruptions, the branches of the Schuylkill; and terminates near Easton and Nazareth, the land about which is likewise in repute. It's mountainous boundary to the north-east is the ridge of Kittatinny, a continuation of North Mountain; and to the south-east the ridge known in that country by the several names of South Mountain, Flying Hills, and Oley Hills, but which, as I have observed, is a direct continuation of Blue Ridge. This circumstance of their bounding one and the same calcareous valley, from the Alleghany arch to Easton, by two lateral chains, is itself a proof of the identity, which I ascribe to their continuations.

The other calcareous district, which is contiguous to this, extends along the back of Blue Ridge on the east, from the gap made by the Potowmack to the neighbourhood of the Schuylkill in the county of Lancaster. It is limited precisely on the south-west and south by the Po-

towmack and the bed of the great Monocacy, which it does not cross to the east: comprises the territory of Frederickstown, the greater part of the course of the Patapsco, and the counties of York and Lancaster, which are justly considered as the granaries of Pennsylvania: and lastly appears to lose itself between Norristown and Rocksbury on the Schuylkill. The remainder of it's boundary, from the Monocacy to the Schuylkill, is not marked by heights, though it is a point of division of several waters, and does not give this district the appearance of a valley, which is observed in the other calcareous regions.

There are two striking differences between the limestone of the west and that of these two districts to the east: the first is, that the substance of the calcareous strata in the east is generally of a pretty deep blue colour, interspersed with numerous white veins of quartz; while the substance of the great calcareous stratum in the west, particularly in Kentucky, is of a gray colour, and a homogeneous and foliated texture.

The second difference is, that the stratum in the west is nearly horizontal, forming a kind of general table underneath the whole country: on the contrary in the east, that is in the counties of Botetourt, Rockbridge, Staunton, Frederick, York, Lancaster, and as far as Nazareth, the

limestone generally lies in a state of confusion, and as it were jumbled together by violence: when these strata are regularly inclined to the horizon, it is commonly at an angle of 40° or 50°, with this singular trait, that in the valley between North Mountain and Blue Ridge the angle is always less, that is below 45°, while in the counties of Lancaster, York, and Frederik, the mountains excepted, it is more habitually above 45°; and this is true with regard to all the other strata, whether of granite or sandstone, which are less inclined in the mountains, more as they approach the sea. At the cascade of the Schuylkill, near Philadelphia, the inclination of the strata of talcky granite is 70°, on the Hudson it reaches as far as 90°.

From these last-mentioned facts we are authorised to conclude, that the whole of the Atlantic coast has been deranged by earthquakes, to which we shall find hereafter it is very subject, while the country west of the Alleghanies has not been disturbed. Dr. Barton too informs us, that the aboriginals of the west have no words in their languages to express earthquakes and volcanoes, while equivalent terms are common and familiar in the dialects of the east. With earthquakes volcanoes are commonly connected, and in fact abundance of basaltes is found in the Alleghany mountains and their valleys, but particular re-

searches would be requisite, to point out the ancient craters with accuracy. I cannot say whether there be any fossil shells or not in the strata to the east, of which I have just been speaking; but I know, that some have been observed in the primitive limestone in the environs of lake Ontario and Niagara *.

Veins and ramifications of limestone might be mentioned also out of these principal regions. There are some in the district of Maine, which supply Boston with lime. Rocky Point, in lake Champlain, is of limestone, as are no doubt other parts in that lake: so are several districts in the neighbourhood of New York: but the most singular instance I am acquainted with in the southern states is that of a ridge, the breadth of which is not above fifteen yards at a medium, and sometimes does not exceed three, though it extends above two hundred miles, from the Potowmack to the Roanoke. As this vein is commonly on the surface, it may be traced with the more certainty, because it is the only one that supplies all the flat country with lime. It's distance from Red Ridge or South-west Mountain, to which it runs parallel, does not exceed from three to five miles.

* Liancourt's Travels, Vol. II.

§ IV. *Region of Sea-sand.*

The fourth region, formed of sea-sand, comprises all the shore, from Sandy Hook, facing Long Island, as far as Florida. It's inland boundary is a stratum or ridge of talcky granite, called foliated stone or Muscovy glass *, which runs constantly in the direction of the coast, that is to say north-east and south-west. This ridge or stratum commences from the extremity of the granitic chains on the right bank of the Hudson, perhaps even from the shore facing Long Island, whence I presume the rocks are continued underneath the sea; and it extends as far as North Carolina beyond the Roanoke, in the form of a slender ridge, from two to six miles broad, and nearly five hundred long. This ridge, as Evans very justly observed, every where marks it's course by the falls, which it occasions in the rivers before they reach the sea; and these falls are the extreme limits of the tide. Thus this talcky ridge cuts the Delaware at Trenton, the Schuylkill two miles above Philadelphia, the Susquehannah above Octarora Creek, the Gunpowder above Joppa, the Patapsco above Elk Ridge,

* The Swedish traveller, Peter Kalm, calls it glimmer.

the Potowmack at George Town, the Rapahannock above Fredericsburg, the Pamunky below it's two branches, fifty miles above Hanover, the James at Richmond, the Appamatox above Petersburg, and the Roanoke above Halifax. No fossils have been observed throughout this stratum.

The land between it and the sea, varying in breadth from thirty to a hundred miles, is evidently sand brought by the ocean, which formerly had for it's shore this ridge itself. At the mouths of the rivers, and on their banks, some argillaceous earths, brought down from the mountains by their inundations, form with this sand a fertile mixture. Evans the geographer has even discovered a subterranean stratum of yellow clay, three or four miles broad, placed longitudinally between the ridge and the shore, which, giving firmness to the adjacent sands, renders them fit for making good bricks, as we see at Philadelphia. These two cases excepted, the sand is the same as that of the neighbouring sea, that is to say white, fine, and in depth reaching as far as twenty feet.

Peter Kalm, who travelled through this country in 1742, observes, that in Pennsylvania and New Jersey the strata are as follows:

1st, Vegetable mould, ten or twelve inches:

2d, Sand mixed with clay, six or seven feet:

3d, Gravel and smooth pebbles, among which

are oysters and clams, such as still exist on the coasts, from three to five feet:

4th, A stratum of black stinking mud, full of osiers and trunks of trees, the thickness of which he does not mention. This stratum, which spoils all the well-water, is found at Philadelphia between fourteen and eighteen feet deep, at Raccoon in New Jersey between thirty or forty feet; at the city of Washington I saw it myself eighteen feet deep at the house of Mr. Law, whose well it spoilt.

5th, Under all these strata is a bed of clay, by which the waters are retained. Perhaps I may be asked on what this bed of clay rests, but I am acquainted with no deeper borings, and after all we must stop somewhere, or like the Indians arrive at the tortoise, that supports the World.

When we consider, that the core of Long Island is a talcky granite; that the reefs and points of rock, which show themselves from space to space as far as Chesapeak bay, and even beyond Norfolk, are of the same granite; and that all the rocks of cape Hatteras are the same; we shall be tempted to consider this as the fundamental nucleus of the coast: but the inclination of the strata in the line of the falls, which is 70° at that of the Schuylkill, and never less than fifty from east to west, displaying a contrary direction, tends rather to

prove, that these strata serve as a support to the interiour country under which they dip*.

§ V. *Region of river Alluvions.*

The fifth and last region is the country that rises in undulations from the ridge of the falls to the feet of the mountains of sandstone or granite. It's limit is less easily traced in Georgia, where the talcky ridge does not appear. This region is marked by it's undulations, consisting in some places of isolated risings, in others of ridges of little hills; and by it's soil being composed of different kinds of earth and stones, in some places jumbled together, in others arranged in strata, which are interrupted or succeed each other several times from the mountains to the coast, but constantly exhibiting the marks of matters rolled down by the waters from the declivities above: and this is in fact the origin of all this country. When we calculate the bulk, rapidity, and number of all it's rivers; the Delaware, the Schuylkill, the Susquehannah, the Potowmack, the Rapahannock, the York, the James, &c.: when we observe, that the

* It is remarked, that this talcky granite contains more mica in the southern parts, and more schorl in the northern parts of this coast.

streams of most of them are from 1200 to 4000 yards broad, and from twenty to fifty feet deep, long before they reach their mouths; and that in their annual inundations they sometimes overflow the flat country to the depth of twenty feet: it is easy to conceive, that such bodies of water must have occasioned prodigious changes in the soil, particularly when in remote ages loftier mountains, gave more impetuosity to their course; when the trees of the forests, swept away by thousands, added force and materials to their ravages; and when ice, accumulated during winters of six or seven months continuance, produced enormous floating masses on it's breaking up, such as those of which the Susquehannah afforded an alarming spectacle in 1784, in which year a mound of ice more than thirty feet high was heaped up at Maccall's Ferry, below Columbia, and was on the point of drowning the whole valley. At the period when the waves of the sea washed the feet of the mountains; as it's residua, which are found there universally, prove beyond doubt it once did; these mountains; being loftier, because they had yet lost no part of what the lapse of ages and the repeated fall of waters has taken from them, rendered the action of these waters much more forcible by their height and steepness: their colder summits were covered for a longer time with more copious snows, and

larger fields of ice : and when the heat of summer, of less duration certainly, yet not less intense, melted this ice and snow, the torrents thus produced tore up the declivities best furnished with earth, hollowed out deeper gullies, and carried along with them ample spoils, which accumulated on the lowest steps of the mountains. Every succeeding year fresh fragments came to choke up the tracks of former years; and the torrents, stopped by mounds of their own raising, acquired fresh strength as they increased in volume, and, attacking them in several points, forced their way through them in the most feeble. The waters then opened for themselves new and varying tracks through the softest mud, for the heaviest substances would always remain behind for want of slope and impulsive force ; and by these processes, repeated for ages, the ancient beds of torrents became valleys ; the former shores and alluvions became coasts and plains ; and the rivers, descending from level to level, leaving their heaviest burdens on slope after slope, depositing in succession the lighter and more soluble, incessantly encroached on the domains of the ocean by accumulations of sand, mud, pebbles, and trees, which served to connect the other materials together. Even in the present day the Missisippi exhibits to us an instructive spectacle of all these grand ope-

rations. It is calculated by Liancourt, that in the space of fourscore years, from 1720 to 1800, it has encroached upon the sea about fifteen miles: thus under the eyes of three generations it has created at it's mouth a new country, which it increases every day, and in which it lays up beds of coal for future ages. Such is the celerity of it's accumulative process, that at New Orleans, a hundred miles* above it's present mouth, a canal lately cut by the governor, baron Carondelet, from the river to lake Pont-Chartrain, has brought to view an interiour bed of earth formed entirely of black mud and trunks of trees heaped together several feet deep, which have not yet had time either to rot or to be converted into coal. Both banks of the river wholly consist of trunks of trees thus agglutinated by mud for a space of more than three hundred miles; and the waters have heaped them up to such a height, that they form a mound on each side from twelve to sixteen feet higher than the adjacent land, which is generally lower; and at the annual rise of the river, which is about twenty-four feet, the exuberant water, being unable to reenter the channel, forms vast and numerous marshes, which will some day become the source of wealth,

* In the original *cent lieues*, but this must be a mistake. I have therefore rendered *lieu*, both here and a little lower down, mile. T.

but are at present an obstacle to agriculture and population.

CHAPTER V.

Of the ancient Lakes that have disappeared.

IN the structure of the mountains of the United States, another circumstance exists, more striking than in any other part of the World, which must singularly have increased the action and varied the movements of the waters. If we attentively examine the land, or even the maps of the country, we must perceive, that the principal chains or ridges of the Alleghanies, Blue Ridge, &c., all run in a transverse direction to the course of the great rivers; and that these rivers have been forced to rupture their mounds, and break through these ridges, in order to make their way to the sea from the bosom of the valleys. This is evident in the rivers James, Potowmack, Susquehannah, Delaware, &c., when they issue from the confines of the mountains to enter into the lower country. But the example that struck me most on the spot was that of the Potowmack, three miles below the

mouth of the Shenando. I was coming from Frederictown, about twenty miles distant, and travelling from the south-east toward the north-west, through a woody country with gentle ascents and descents. After I had crossed one ridge, pretty distinctly marked though by no means steep, I began to see before me eleven or twelve miles westward the chain of Blue Ridge, resembling a lofty rampart covered with forests, and having a breach through it from top to bottom. I again descended into an undulating woody country, which still separated me from it; and at length on approaching it I found myself at the foot of this rampart, which I had to cross, and which appeared to me about three hundred and fifty yards high*. On emerging from the wood, I had a full view of the breach, which I presently judged to be twelve or thirteen hundred yards wide. Through the bottom of this breach ran the Potowmack, leaving on it's left, on which side I was, a passable bank or slope; as broad as itself, and on it's right washing the foot of the breach. On both sides of the breach, from

* For want of time and instruments my mode of measuring was, I pitched on several trees at the foot of the ridges, of a known height of about five and twenty yards, and repeated from step to step the comparative measure, making allowance for the difference of distance according to the laws of perspective.

top to bottom, many trees grow among the rocks, and in part conceal the place of the rupture : but about two thirds of the way up, on the right side of the river, a large perpendicular space remains quite bare, and displays the traces and scars of the ancient band, or natural wall, formed of gray quartz, which the victorious river has overthrown, rolling it's fragments farther on it's course. Some large blocks, that have resisted it's force, still remain as testimonials of it at no great distance. The bottom of it's bed at the spot itself is rugged with fixed rocks, which it is gradually wearing away. It's rapid waters boil and foam through these obstacles, which for a space of two miles form very dangerous falls or rapids. I saw them covered with the fragments of some boats wrecked a few days before*, in which sixty casks of flower were lost.

On proceeding up this defile, it narrows so that the river leaves only room for a carriage road, and even this is overflowed by it occasionally. From the sides of the mountain likewise issue a number of springs, which contribute further to wear away this road in several places; and as the greater part of it is solid rock, consisting of gray quartz,

* The rashness of the American sailors renders similar accidents frequent both in their rivers and on the ocean.

sandstone, and even granite, I consider the projected canal there as impracticable. At the end of three miles we come to the confluence of the river Shenando, which issues out suddenly from the steep back of Blue Ridge on the left, the foot of which it washes in it's course. I conceive it's breadth at this place to be about a third of that of the Potowmack, which appeared to me to be two hundred yards. A little higher up we cross the Potowmack at Harper's Ferry, and ascend a steep hill, to reach the inn of the place. From this projecting point the defile appears like a large tunnel, where the eye, confined in it's view, sees nothing but rocks and verdure, without being able to penetrate to the extremity of the gap. On coming from Frederictown we equally see nothing of the rich prospect mentioned in Mr. Jefferson's notes. On my making this remark to that gentleman a few days after, he informed me, that he had his description from a French engineer, who during the war had ascended the summit of the mountain; and I can easily conceive, that from such an elevation the prospect must be noble in a wild country, the view of which is uninterrupted.

The more I considered this spot and it's circumstances, the more I confirmed myself in the opinion, that formerly the chains of Blue Ridge in it's entire state completely denied the Potow-

mack an exit; and that then all the waters of the upper part of that river, having no issue, formed several considerable lakes. The numerous transverse chains, that succeed each other beyond Fort Cumberland, could not fail to occasion several more west of North Mountain. On the other hand all the valley of Shenando and Conigocheague must have been the basin of a single lake from Staunton to Chambersburg; and as the level of the hills, even those from which these two rivers derive their source, is much below the chains of Blue Ridge and North Mountain, it is evident, that this lake must have been bounded at first only by the general line of the summit of these two great chains, so that in the earliest ages it must have spread like them toward the south as far as the great arch of the Alleghanies. At that period the two upper branches of James River, equally barred by Blue Ridge, would have swelled it with all their waters; while toward the north the general level of the lake, finding no obstacles, must have spread itself between Blue Ridge and the chain of Kittatinny, not only to the Susquehannah and Schuylkill, but beyond the Schuylkill and even the Delaware. Then all the lower country, that which separates Blue Ridge from the sea, had only smaller streams furnished by the eastern declivities of Blue Ridge, and the overflowing of the lake

poured from it's summits. In consequence the rivers there being less, and the land generally more flat, the ridge of talcky granite must have stopped the waters, and formed marshy lakes. The sea must have come up to the vicinity of this ridge, and there occasioned other marshes, of the same kind as Dismal Swamp near Norfolk: and if the reader recollect the stratum of black mud mingled with osiers and trees, which is found every where in boring on the coast, he will see in it a proof of the truth of this hypothesis. With the aid of earthquakes, which are very frequent throughout the Atlantic coast, as I shall hereafter have occasion to observe more at large, the waters, incessantly attacking and undermining the summits that constituted their mounds, formed passages through them: the moment that larger bodies of water could escape, the breaches were extended with more rapidity; and the powerful action of the falls, demolishing the ridge from top to bottom, would ultimately open a passage for the more weighty body of the lake. This operation must have been so much the easier, as Blue Ridge in general is not a homogeneous mass crystallized in vast strata, but a heap of detached blocks of different magnitudes, mixed with vegetable mould easily diffusible in water: it is in fact a wall, the stones of which are embedded in clay; and as it's

declivities are very steep, it frequently happens, that thaws and heavy rains, by carrying away the earth, deprive the masses of stone of their support, and then the fall of one or more of these occasions very considerable *stone-slips* or *avalanches**, which continue for several hours. From this circumstance the falls from the lake must have acted with more efficacy and rapidity. Their first attempts have left traces in those gaps, with which the line of summits is indented from space to space. It may be clearly perceived on the spot, that these places were the first drains of the surplus water, subsequently abandoned for others, where the work of demolition was more easy. It is obvious, that the lakes flowing off must change the whole face of the lower country. By this were brought down all those earths of secondary formation, that compose the present plain. The ridge of talcky granite, pressed by more frequent and voluminous inundations, gave way in several points, and it's marshes added their mud to the black mud of the shore, which at present we find buried under the alluvial earth, afterward brought down by the enlarged rivers.

In the valley between Blue Ridge and North

* *Avalanche,* snow-slip, the fall of a large mass of frozen snow, breaking from the *glaciers,* or icy summits of mountains, not unfrequent in the Alps, here applied to the stone. T.

Mountain the changes that took place were conformable to the mode in which the water flowed off. Several breaches having at once or in succession given a passage to the streams of water now called the rivers James, Potowmack, Susquehannah, Schuylkill, and Delaware, their general and common reservoir was divided into as many distinct lakes, separated by the risings of the ground that exceeded their level. Each of these lakes had it's particular drain, and this drain being at length worn down to the lowest level, the land was left completely uncovered. This must have occurred earlier with the James, Susquehannah, and Delaware, because their basins are more elevated: and it must have happened more recently with the Potowmack for the opposite reason, it's basin being the deepest of all. It is much to be wished, that the government of the United States, or some scientific society in the country, would employ able engineers to make researches on this interesting subject, which would infallibly afford more minute proofs of what I have advanced, and new views highly conducive to our knowledge of the various revolutions, that our globe has formerly undergone.

How far the Delaware then extended the reflux of it's waters toward the east I cannot ascertain. It appears, that it's basin was bounded by the

ridge that accompanies it's left bank, and which is the apparent continuation of Blue Ridge and North Mountain. It is probable, that it's basin has always been separate from that of the Hudson; as it is certain, that the Hudson has always had a distinct basin, the limit and mound of which were above West Point, at the place called the Highlands. To every one who views this spot it seems incontestible, that the transverse chain bearing this name was formerly a bar to the course of the river, and kept it's waters at a considerable height: and when I observe, that the tide flows as far as ten miles above Albany, this low level in so great an extent, compared with the elevation of the mountains that surround this basin, induces me to imagine, that the lake must have reached as far as the rapids at Fort Edward, or perhaps even communicated with lakes George and Champlain, and in this state rendered imperceptible the Cohoez or falls of the Mohawk, the level of which it surpassed. These falls could not be formed, till the lake had drained off through the gap at West Point; and the existence of this lake explaining the traces of alluvions, petrified shells, and strata of schist and clay, mentioned by Dr. Mitchill, proves the justice of the inductions of this judicious observer respecting the stationary presence of waters in times past.

These ancient lakes too, now dry by the rupture of their mounds, explain the banquettes or flats of one or two stages observed on the banks of most of the rivers of America; and which are particularly remarkable in those of the western country, as the Tenessee, the Kentucky, the Missisippi, the Kanhaway, and the Ohio. I will elucidate this fact by a delineation of the bed of this last river, at the place called Cincinnati, or Fort Washington, the head quarters of the North-western Territory.

a a the bed of the river at it's lowest ebb, such as I saw it in the month of August 1796.

b b it's bank, nearly vertical, formed of strata of gravel, sand, and mould, and undermined by the floods, that occur every spring. This bank is near fifty feet high.

c c the first banquette, four hundred paces, or nine hundred feet, broad, likewise formed of gravel and rounded stones. The high floods reach this banquette, and wash the gravel and stones still more and more *.

* This banquette and the slopes along the whole course of the Ohio are covered with the detestable thorn-apple, datura stramonium, which I was told was imported from Virginia accidentally mingled with other seeds. It has spread to such a degree, that a person cannot take a walk on the banquettes without being poisoned by it's nauseous narcotic smell.

d d is a talus or slope of gentle ascent, about thirty feet high, composed of various strata of gravel and mould, full of fossil shells and substances of river growth, which are equally to be observed in the bank itself. The floods never pass this talus.

e e a second banquette, which extends to the foot of the neighbouring hills, and on which is built the new town of Cincinnati*. Such is the right bank of the river.

The left bank has similar flats and slopes opposite to these at corresponding heights. In other places the banquettes appear only on one side; but then the opposite bank is either a steep cliff, on which the river was incapable of leaving any permanent traces, or such a broad plain, that the eye cannot follow them to the distant hills.

When we examine the arrangement of these banquettes, their strata, and taluses, with the nature of their substances, we remain convinced, that even the most elevated part of the plain, that which extends from the city to the hills, has been the seat of waters, and even the primitive bed of

* It consists of about 400 wooden houses, some constructed of planks, others of logs, which were begun to be built during the Indian war, about 1791. It was at first only a camp of reserve and park of artillery.

the river, which appears to have had three at so many different periods.

The first of these periods was the time when the transverse ridges of the hills, yet entire as I have described them above, barred up the course of the river, and acting as mounds to it, kept the water level with their summits. All the country within this level was then one large lake or marsh of stagnant water. In lapse of time, and from the periodical action of the floods occasioned by the annual melting of the snows, some feeble parts of the mound were worn away by the waters. One of the gaps having given way to the current, the whole effort of the waters was collected in that point, hollowed it out to a greater depth, and thus sunk the level of the lake several yards. This first operation uncovered the upper banquette *e e*; and the waters of the river, yet a lake, had for their bed the banquette *c c*, and for their shore the talus *d d*.

The time that the waters remained in this bed was the second period.

The third commenced, when, the fall of water having been still farther lowered in the centre, from the force of the current being more concentrated, and thus rendered more active, the river scooped itself out a narrower and deeper channel, which is

that in which it flows at present, and left the lower banquette *c c* habitually dry.

It is probable, that the Ohio has been obstructed in more than one place, from Pittsburg to the rapids of Louisville. When I went down this river from the Kanhaway, not having those ideas which my subsequent observations of facts suggested, I did not pay particular attention to the transverse chains I met with; but I recollect, that I remarked several of considerable size, particularly toward Galliopolis and as far as the Sciota, very capable of answering this purpose. It was not till my return from Fort Vincents on the Wabash, that I was struck with the disposition of a chain below Silver Creek, about five miles from the rapids of the Ohio. This ridge, which Canadian travellers have vaguely mentioned by the name of *Côtes* (Ribs), crosses the basin of the Ohio from north to south: it has obliged the river to change it's direction from the east toward the west, to seek an issue, which in fact it finds at the confluence of Salt River; and it may even be said, that it required the copious and rapid waters of this river, and it's numerous branches, to force the mound, that opposed it's way. The pretty steep declivity of these Ribs requires about a quarter of an hour to descend it, though the road is commodious; and by compa-

rison with other hills, I conceived the perpendicular height to be about four hundred feet. The summit is too thickly covered with wood for the lateral course of the chain to be seen; but it may be perceived, that it runs very far north and south, and closes the basin of the Ohio throughout it's whole breadth. This basin, viewed from the summit, exhibits so much of the appearances of a lake, that the idea of the ancient existence of one here, for which I was previously prepared by all the facts I have mentioned, had to me every mark of probability. Other circumstances tended to confirm this idea; for I have observed, that from this chain to White River, and beyond it, eight miles from Fort Vincents, the country is intersected by a number of ridges, many of them steep and lofty, which render the road rugged and toilsome: they are so particularly beyond Blue River, and on both banks of White River; and their direction is every where such, that they meet the Ohio transversely. On the other hand I found at Louisville, that the south or Kentucky bank of the river corresponding to them had similar ridges; so that in this part there is a succession of ridges, capable of opposing powerful obstacles to the waters. It is not till lower down the river, that the country becomes flat, and the ample savannahs of the Wabash and Green River commence, which, extend-

ing to the Missisippi, exclude every idea of any other mound on that side*.

There is another general fact in favour of my hypothesis. It is noticed as a singularity in Kentucky, that all the rivers of that country flow more slowly near their sources, and more rapidly near their mouths; which is directly the reverse of what takes place in most rivers of other countries: whence we must infer, that the upper bed of the rivers of Kentucky is a flat country, and that their lower bed, at the entrances of the vale of the Ohio, is a descending slope. Now this perfectly accords with my idea of an ancient lake: for at the time when this lake extended to the foot of the Alleghanies, it's bottom, particularly toward it's cir-

* A settler in Tenessee pointed out to me, that all the rivers in that country, which flow directly into the Missisippi, have in like manner banquettes; which, he observed, was commonly attributed to this circumstance, that every year, in the month of May, the Missisippi rises about five and twenty feet, which forces all it's branches to overflow their banks, and form themselves a wider bed. But this rise of the Missisippi acts precisely as a temporary mound to it's branches, and confirms in this respect the theory, which I have advanced for other cases. I shall remark in my turn, that the Missisippi is constantly confined on it's left or east side by a chain of heights, which in few places leave four or five miles of plain for it to overflow; while on the west or right side, as soon as it has surmounted it's bank, it's waters are lost on a flat more than fifty miles broad.

cumference, must have been nearly smooth and level, it's surface being broken by no action of the waters: but when the mound, that confined this tranquil body of water, was broken down, the soil, laid bare, began to be furrowed by it's drains; and when at length the current, concentrated in the vale of the Ohio, demolished it's dike more rapidly, the soil of this vale, washed away with violence, left a vast channel, the slopes of which occasioned the waters of the plain to flow to it more quickly; and hence this current, which, notwithstanding the alterations that have been subsequently going on, has continued more rapid even to the present day.

Admitting then, that the Ohio has been barred up, either by the chain of Silver Creek, or any other contiguous to it, a lake of vast extent must have been the result: for from Pittsburg the ground slopes so gently, that the river, when low, does not run two miles an hour, which may be calculated as equivalent to a fall of four inches in a mile. But the distance from Pittsburg to the rapids of Louisville, following the windings of the river, does not actually amount to five hundred and ninety miles*.

* Hutchins supposes near seven hundred miles: but it must be observed, that this geographer had no exact and

From these data we have a difference of level amounting to about a hundred and eighty, or say two hundred feet. For want of precise measures of the height of the ridge of the Ribs, let us suppose it two hundred: it will still be clear, that such a mound could check the waters, and turn them back as far as Pittsburg. And such an hypothesis will appear still the more probable to the reader, when he recals to mind what I have already said, p. 28, that all the space included between the Ohio and Lake Erie is one large flat, of a slope scarcely perceptible: an assertion demonstrated by several incontestible hydraulic facts.

1. The Ohio in it's annual inundations, even before it issues from it's bed to cover the first banquette, or before it is swoln to the depth of fifty

geometrical means of measuring the Ohio: he went down it in a boat, during the time of a war with the savages, calculating his progress by the current, without making any observations on shore, for fear of a surprise, of which he was in constant danger. Within these few years, the navigation of the river being more free, more accurate calculations have been formed, which have proved all those of Hutchins to have erred by allowing too much: thus from the Little Miami to the rapids the distance is calculated to be a hundred and forty-five miles, instead of a hundred and eighty-four, which he made it; and from the Great Kanhaway to the Little Miami two hundred and seven, instead of two hundred and thirty-one. His measures are in general diminished one seventh.

feet, keeps back the water of the Great Miami as far as Grenville, which is seventy-two miles up the country to the north; where it occasions a stagnation of that river, and even an inundation, as I was assured by the officers whom I found at that post, the head quarters of the expedition under general Wayne in 1794.

2. In the vernal inundations the north branch of the Great Miami forms but one with the south branch of the Miami of Lake Erie*, called St. Mary's river; the carrying place† of three miles, which separates their heads, being covered with water, so that you can go in a boat from Loromie's Store to Girty's Town, that is from a branch of the Ohio to one of a river that runs into Lake Erie, as I myself saw on the spot in 1796.

3. At this same place of Loromie's Store commences an eastern branch of the Wabash, which might be united with both the above rivers by a simple ditch: and above Fort Wayne this same

* There are three Miamis; the Little, above Cincinnati; the second, or Great Miami, below that fort; both of which run into the Ohio; and the third, which runs into Lake Erie.

† A carrying place is the ground between two navigable rivers; so called because the boats must be carried over it from one to the other: in America it is now very commonly called a *portage*.

Wabash in the flood season always forms a communication, by means of one of it's northern branches, with the Miami of Lake Erie.

4. During the winter of 1792 a mercantile house, from which I received the information, dispatched two canoes from Fort Detroit on the St. Lawrence, which passed immediately, without carrying, from the river Huron, running into Lake Erie, to Grand River, which runs into Lake Michegan, by the waters at the head of each of these rivers overflowing.

5. The Muskingum, which runs into the Ohio, also communicates by means of it's sources, and of small lakes, with the waters of the river Cayuga, which flows into Lake Erie.

From all these facts united it follows, that the surface of the flat between Lake Erie and the Ohio cannot exceed the level of the first banquette of this river by more than a hundred feet, nor that of the second, which is the general surface of the country, by more than seventy; consequently a mound of two hundred feet at Silver Creek would have been sufficient to keep back it's waters not only as far as Lake Erie, but even to spread them from the last slopes of the Alleghanies to the north of Lake Superior.

But whatever elevation we allow this natural mound, or if we suppose there were several in dif-

ferent places, keeping back the water in succession, the existence of sedentary waters in this western country, and of ancient lakes such as I have pointed out between Blue Ridge and North Mountain, is not the less an incontestible fact, as must appear to every one who contemplates the country; and this fact explains in a simple and satisfactory manner a number of local circumstances, which on the other hand serve as proofs of the fact. For instance, these ancient lakes explain why in every part of the basin of the Ohio the land is always levelled in horizontal beds of different heights; why these beds are placed in the order of their specific gravity; and why we find in various places remains of trees, of osiers, of plants, and even of animals, as the bones of mammoths in heaps among others at the place called Bigbone Licks, thirty-six miles above the mouth of the river Kentucky, and which could not have been thus collected together except by the action of water: lastly they as happily as naturally account for the formation of the beds of coal, which are found principally in certain situations and in particular districts.

In fact, from the researches which the industry of the inhabitants has made more frequently within these twenty years, it appears, that the principal seat of coal is above Pittsburg, in the space between the Laurel Mountains and the rivers Alle-

ghany and Monongahela, where there exists almost throughout a stratum at the mean depth of 12 or 16 feet. This stratum is supported by the horizontal bed of calcareous stones, and covered with strata of schists and slate; it rises and falls with these on the hills and in the valleys; and it is thicker in the former, thinner in the latter, being in general from six to seven feet. On considering it's local situation we see it occupies the lower basin of the two rivers I ha vementioned, and of their branches, the Yohogany and Kiskemanitas, all of which flow through a nearly flat country into the Ohio below Pittsburg. Now on the hypothesis of the great lake of which I have spoken, this part will be found to have been originally the lower extremity of the lake, and the part where it's being kept back would have occasioned still water. It is admitted by natural philosophers, that coal is formed of heaps of trees carried away by rivers and floods, and afterward covered with earth. These heaps are not accumulated in the course of the stream, but in parts out of it, where they are left to their own weight. This process may be observed even now in many rivers of the United States, particularly in the Missisippi, which as I have said, annually carries along with it a great number of trees. Some of these trees are deposited in the creeks or bays, into which they are

carried by the eddies, and there left in still water; but the greater part reach the borders of the ocean, where the current being balanced by the tide, they are rendered stationary, and buried under the mud and sand by the double action of the stream of the river, and the reflux of the sea. In the same manner anciently the rivers, that flow from the Alleghanies and Laurel mountains into the basin of the Ohio, finding toward Pittsburg the dead waters and tail of the great lake, there deposited the trees, which they still carry away by thousands, when the frost breaks up and the snows melt in the spring: these trees were accumulated in strata level as the fluid that bore them; and the mound of the lake sinking gradually, as I have explained, it's tail was likewise lowered by degrees, and the place of deposit changed as it changed, forming that vast bed, which in the lapse of ages has been subsequently covered with earth and gravel, and acquired the state in which we see it. Did we know the length of time requisite for converting trees buried under such circumstances into coal, these operations of nature would form chronological tables of far superiour authority to the dreams of visionaries among a barbarous or superstitious people.

Coal is found in several other parts of the United States, and always in circumstances analogous to those I have just described.

Evans speaks of a mine near the Muskingum, opposite the mouth of the rivulet of Laminski-cola, which took fire in 1748, and burnt for a whole year. This mine is a part of the mass of which I have been speaking, and almost all the great rivers, that run into the Ohio, must have deposits of this kind in their flat parts, and in the places of their eddies.

The upper branch of the Potowmack, above and to the left of Fort Cumberland, has been celebrated some years for it's strata of coal forming downs on it's banks, so that boats can lie at the side of the river, and load themselves with coal immediately from it. Now this country has every appearance of a lake, produced by one or more of the numerous transverse ridges, that bar the Potowmack above and below Fort Cumberland.

In Virginia the bed of James River rests on a very considerable bed of coal. At two or three places where shafts have been sunk on it's left bank, after digging a hundred and twenty feet through a red clay, a bed of coal about four and twenty feet thick has been found on an inclined stratum of granite. It is evident, that at the rapids lower down, where the course of the river is still checked, it was once completely obstructed; and then there must have been a standing water,

and very probably a lake, in this spot. The reader will observe, that wherever there is a rapid, a stagnation takes place in the sheet of water above it, just as there is at a mill-head: consequently the drifted trees must have accumulated in this place; and when the river had hollowed out it's gap, and sunk it's level, the annual floods brought down with them and deposited the red clay now found there. It is evident, that this clay was brought from some other place, for earth of such a quality belongs to the upper part of the course of the river, particularly to the ridge called South-west.

It is possible, that veins or mines of coal not adapted to this theory may be mentioned or discovered on the Atlantic coast. But one or more such instances will not be sufficient to subvert it, for the whole of this coast, or all the land between the ocean and the Alleghanies from the St. Lawrence to the West Indies, has been deranged by earthquakes, the traces of which are every where to be seen; and these earthquakes have altered and nearly destroyed the regular horizontal arrangement of the strata throughout the whole of this space.

Having sufficiently discussed the state and circumstances of the soil of the United States, it remains for me to say a few words respecting one

of the most remarkable natural singularities of the country; that by which it is most particularly characterized, since it's parallel has never yet been found throughout the globe; I mean the fall of the river St. Lawrence at Niagara.

CHAPTER VI.

Of the Fall of Niagara and some other remarkable Falls.

Some travels lately published* have already given such a description of the Fall of Niagara, as will convey an idea of this gigantic phenomenon; but as they appear to me, to have sought rather to describe the grandeur of the spectacle than it's topographical circumstances, of which however this grandeur is the effect, I think it incumbent on me to attend particularly to these, which are interesting in a distinct point of view.

It is an incident truly astonishing in geography, to see a river seven hundred and forty yards broad,

* Travels in the United States of America by Larochefoucault-Liancourt, Vol. II. Travels in Upper Canada by Isaac Weld, Vol. II. These two books may be considered as a travelling library of the United States.

RPJCH

Section of the Fall in the middle of the River.

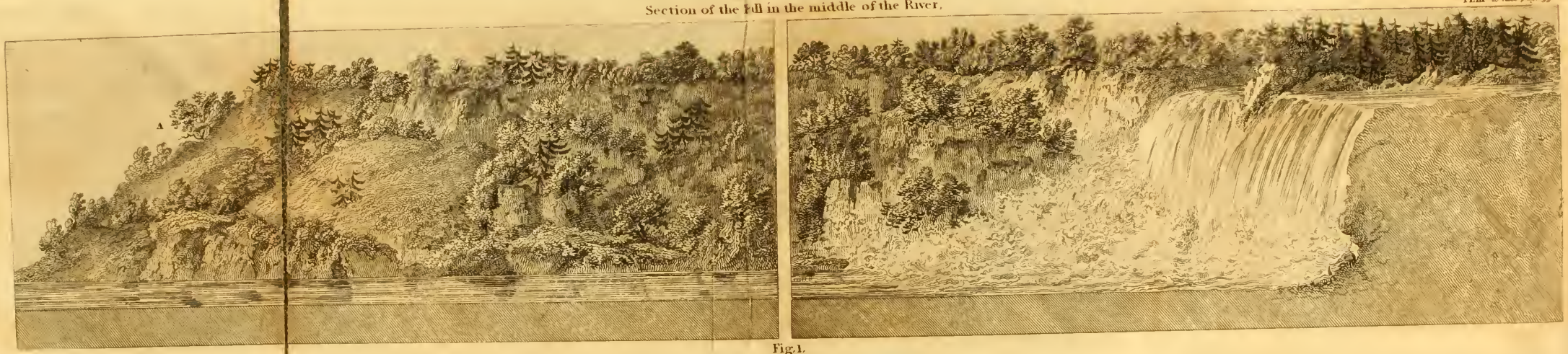


Fig.1.

100 200 300 French feet

The Falls of Niagara,with the adjacent Country.

Fig. 2

1000 2000 Toises

(that is, about the length of the canal in St. James's Park*,) and of the mean depth of fifteen feet, the ground of the plain through which it winds suddenly failing, precipitate itself in one vast sheet a hundred and fifty feet perpendicularly to a lower plain, where it continues it's course, without the eye of the spectator being able to perceive any mountain, by which it's current has been checked or obstructed. By what singularity of local circumstances Nature has prepared and produced this prodigious scene does not present itself to the imagination; and when we have discovered it, we are almost as much surprised at the simplicity of the means, as at the grandeur of the effect.

That the reader may conceive an idea of the picture without difficulty, he must at first recollect, that all the country included between Lake Erie and the Ohio is a vast plain of a higher level than almost the whole of the continent, as is proved by the sources of the different rivers that flow from it, some running into the Gulf of Mexico, others into the Northern Ocean, and others into the Atlantic. On the west and north-

* In the original, 'the length of the garden of the Tuileries,' to which I have substituted an equivalent better known to the readers of this translation. T.

west this plain stretches without interruption from the Savannahs beyond Missisippi and the lakes to which it affords a bed; on the south and east it extends to the ridges of the Alleghanies; but on the north, when it has passed Lake Erie, about six or seven miles before it reaches Lake Ontario, the ground suddenly sinks, and by an abrupt descent runs into another plain, the level of which is two hundred and seventy feet lower, and in which is Lake Ontario. On coming from the neighbourhood of this lake * the disposition of the ground is easily perceived: from a great distance on the sheet of tranquil water you see before you as it were a lofty rampart (a), the slope of which, covered with wood, seems to forbid all passage farther: you enter the Niagara, up which you proceed as far as Queenstown (b), and you soon discover on the left a narrow and deep valley (c), whence the river issues with some rapidity, but tranquil: the cascade still remains a mystery: the slope abovementioned comes from Toronto, or even farther, and running along the north shore of Lake Ontario, at the variable distance of a mile or two, turns easterly by a curve to the south shore of the lake, crosses the Niagara seven miles from it's mouth, the Genessee

* See on plate III, fig. 2, the letters of reference, a, a, a.

eight miles, then bends again toward the south, and in a line five or six miles west of Lake Seneca, where I observed it's declivity*, it proceeds to join the ramifications of the Alleghanies, from which this lake derives the principal part of it's waters, and is nearly on a level with them.

Indeed it may be said, that, almost on a level in this part with these mountains, the plain is continued with them to Hudson River, where it terminates by a slope as high and steep as at Niagara; which presents another incident equally remarkable in geography, that of a country into which the tide penetrates upward of a hundred and sixty six miles, precisely at the foot of another, in which rise such rivers as the Delaware, that runs a course of more than four hundred.

The local circumstances of the Niagara are far less obvious to those, who come from the neighbourhood of Lake Erie, as was my case on the

* A mile and half from New Geneva, coming from Canandaqua, I found myself on the brink of an amphitheatre, of a larger and more gentle declivity than one of which I shall have to speak presently; but it's prospect is still more grand, for at one view, uninterrupted by any obstacle, you see a vast basin, perfectly level, consisting of Lake Ontario on the north-east, and on the east of a sea of forests, interspersed with a few farms and villages, and with the waters of the Iroquois lakes.

24th of October, 1796. From this lake, and even sailing on it's waters, there is no mountain in view, except over Presqu'isle, where some low and distant summits may be discovered in the north-west part of Pennsylvania. The country through which the Niagara pursues it's course exhibits nothing but a vast plain covered with wood; and the current of the river, which scarcely runs three miles an hour, gives no indication of the circumstance that awaits it lower down. It is not till you come near the mouth of the little river Chipaway, eighteen miles below Lake Erie, that the current growing more rapid warns the boatmen to keep close to the shore, and land at the village built at that place. Here the river expands a sheet of water about 750 yards broad, skirted on all sides with high trees. You are only two miles and half from the cascade (e); you hear a distant murmuring noise, like that of the waves of the sea, and more or less loud, according to the direction of the wind; but the eye yet perceives nothing. On the left bank of the river, which is concealed from your view by trees, you pursue on foot a rude path (f) traced by carts. After proceeding a mile you perceive the river turning to the left, and a mile lower down rushing among shoals, which it covers with foam (g). Beyond these breakers a cloud of vapour is seen

to ascend from an opening in the forest, and no farther trace of the river appears. The din grows louder, but no fall is yet to be perceived. You continue your way along the shore, which at first is not more than ten or twelve feet higher than the surface of the water, but soon rises to twenty, thirty, fifty, and by this declivity indicates the acceleration of the current *. Some gullies then oblige you, to quit the side of the river, leaving it on your right; to return to it, you cross the grounds belonging to a farm-house; and at length, emerging from amidst the trees and underwood, you reach the side of the cataract †. Here you see the whole river rush into a chasm or channel hollowed out by itself, about 200 feet deep, and 1200 broad. In this it is encased as between two walls of rock, the sides of which are covered with cedars, firs, beech, oaks, birch, &c. Travellers commonly view the fall from this spot, where a jutting rock (i) overhangs the abyss: some of our party gave it the preference; but the rest, of whom I was one, being informed, that we could descend to the bottom ten or twelve hundred yards lower down, by Mrs. Simcoe's ladder,

* The settlers have already availed themselves of this slope, to construct saw and flower mills, h h.

† Fig. 1. is a section taken at the line x y of fig. 2.

imagined we should enjoy the grandeur of the spectacle to more advantage there, as objects of this kind produce a greater effect, when we look up to them from below. Accordingly we went down this ladder, though not without difficulty, as the ladders are nothing but trunks of trees with notches cut in them, and fixed against the side of the precipice *. On reaching the bottom we could proceed upward toward the fall by a shore consisting of fragments of rock and sand, where we found the carcasses of some deer and wild boars, which the current had hurried down the cataract on their attempting to swim across the river above it. Near us the stream ran very rapidly over a bed of rocks, but without being at all dangerous. On our left, in front, was a part of the fall about 200 feet wide, separated from the grand cataract by a small island. Beyond it, and facing us, the great cataract appeared in form of a horseshoe about 1200 feet broad, concealed on the right by the projecting rocks of the side of the chasm. At more than six hundred yards distance the spray of the water fell so as to wet us like rain. As I was but just recovering from

* According to this description, it must have been the Indian ladder, not Mrs. Simcoe's, that the author descended. See Weld's Travels, Vol. II, p. 122, 3. T.

a malignant fever, with which I had been attacked at Fort Detroit, I had neither strength nor inclination to proceed farther: some of my companions, however, attempted to reach the cascade; but they were soon forced to return by obstacles, not so easy to surmount as they had imagined. An English traveller, with whom I crossed Lake Erie, had been more fortunate than we two months before. Led by good guides, and having both time and means that were not in our power, he penetrated as far as it is possible without loss of life; and to satisfy the just curiosity of the reader, I will copy the description given by him in his work entitled Travels in Canada, which has been translated into French by Mr. Castera.

'On arriving at the bottom of the cliff, you find yourself in the midst of huge piles of mishapen rocks, with great masses of earth and rocks projecting from the side of the cliff, and overgrown with pines and cedars hanging over your head, apparently ready to tumble down and crush you to atoms. Many of the large trees growing with their heads downwards, being suspended by their roots, which had taken such a firm hold in the ground at the top of the cliff, that when part of it gave way the trees did not fall altogether. The river before you here is somewhat more than a

quarter of a mile wide; and on the opposite side of it, a little to the right, the Fort Schloper Fall is seen to great advantage; what you see of the Horseshoe Fall also appears in a very favourable point of view; the projecting cliff conceals nearly one half of it. The Fort Schloper Fall is skirted at bottom by milk-white foam, which ascends in thick volumes from the rocks; but it is not seen to rise above the fall like a cloud of smoke, as is the case at the Horse-shoe Fall; nevertheless the spray is so considerable, that it descends on the opposite side of the river, at the foot of Simcoe's ladder, like rain.

'Having reached the margin of the river, we proceeded towards the Great Fall, along the strand, which for a considerable part of the way thither consists of horizontal beds of limestone rock, covered with gravel, except, indeed, where great piles of stones have fallen from the sides of the cliff. These horizontal beds of rock, in some places, extend very far into the river, forming points which break the force of the current, and occasion strong eddies along particular parts of the shore. Here great numbers of the bodies of fishes, that, unable to stem the current of the river above the falls, have been carried down them, and consequently killed, are washed up. The shore is likewise found strewed with trees, and large pieces

of timber, that have been swept away from the saw mills above the falls, and carried down the precipice. The timber is generally terribly shattered, and the carcasses of all the large animals, particularly of the large fishes, are found very much bruised. A dreadful stench arises from the quantity of putrid matter lying on the shore, and numberless birds of prey, attracted by it, are always seen hovering about the place.

'From the foot of Simcoe's ladder you may walk along the strand for some distance without inconvenience; but as you approach the Horseshoe Fall, the way becomes more and more rugged. In some places, where the cliff has crumbled down, huge mounds of earth, rocks, and trees, reaching to the water's edge, oppose your course; it seems impossible to pass them; and indeed, without a guide, a stranger would never find his way to the opposite side; for to get there it is necessary to mount nearly to their top, and then to crawl on your hands and knees through long dark holes, where passages are left open between the torn up rocks and trees. After passing these mounds, you have to climb from rock to rock close under the cliff, for there is but little space here between the cliff and the river, and these rocks are so slippery, owing to the continual moisture from the spray, which descends very heavily,

that without the utmost precaution it is scarcely possible to escape a fall. At the distance of a quarter of a mile from the Great Fall we were as wet, owing to the spray, as if each of us had been thrown into the river.

'There is nothing whatsoever to prevent you from passing to the very foot of the great fall; and you might even proceed behind the prodigious sheet of water that comes pouring down from the top of the precipice, for the water falls from the edge of a projecting rock; and moreover, caverns of a very considerable size have been hollowed out of the rocks at the bottom of the precipice, owing to the violent ebullition of the water, which extend some way underneath the bed of the upper part of the river. I advanced within about six yards of the edge of the sheet of water, just far enough to peep into the caverns behind it; but here my breath was nearly taken away by the violent whirlwind that always rages at the bottom of the cataract, occasioned by the concussion of such a vast body of water against the rocks. I confess I had no inclination at the time to go farther; nor, indeed, any of us afterwards attempted to explore the dreary confines of these caverns, where death seemed to await him that should be daring enough to enter their threatening jaws. No words can convey an adequate idea of this awful grandeur of the

scene at this place. Your senses are appalled by the sight of the immense body of water that comes pouring down so closely to you from the top of the stupendous precipice, and by the thundering sound of the billows dashing against the rocky sides of the caverns below; you tremble with reverential fear, when you consider that a blast of the whirlwind might sweep you from off the slippery rocks on which you stand, and precipitate you into the dreadful gulf beneath, from whence all the power of man could not extricate you; you feel what an insignificant being you are in the creation, and your mind is forcibly impressed with an awful idea of the power of that almighty Being who commanded the waters to flow.'—*Weld's Travels in North America*, Vol. II, p. 123—129.

Such is the narrative of Mr. Weld.

It remained for me to discover how the river disengaged itself from the chasm, in which it was confined. I continued my way on foot through the wood, in a path with a constant descent, for the space of six miles, endeavouring to conjecture what it's issue would prove, when at length I arrived on the brink of the slope, of which I have spoken above*. The Canadians call this place the Plato, a corruption of *plateau*, though indeed

* See Pl. III, let. A.

platform would have been still more applicable. My eye then disengaged from the trees discovered at once an immense horizon: in front, to the north, was Lake Ontario, resembling a sea: on this side of it a long meadow, through which the Niagara flows to it, making three elbows in it's course: at my feet, as in the bottom of a valley, the little village of Queenstown on the west bank of the river: while on my right the river at length issued out as from a cavern, the mouth and sides of the chasm being concealed by trees.

Whoever examines all the circumstances of this spot with attention will clearly perceive, that here the fall first commenced, and that the river, by sawing down the bed of rock, if I may use the expression, has hollowed out the chasm, and continued carrying back it's breach from age to age, till it has at length reached the spot where the cascade now is. There it continues it's secular labours with slow but indefatigable activity. The oldest inhabitants of the country, as Mr. Weld observes, remember having seen the cataract several paces beyond it's present place: an English officer, who has been stationed at Fort Erie these thirty years, mentioned to him positive facts, proving that rocks then existing had been undermined and swallowed up: the winter after my visit, that

of 1797, the thaw and floods broke off considerable blocks, that checked the passage of the water: and if Europeans, since they first saw it, which is more than a century and half ago, had taken accurate notes of the state of the fall, we should by this time have had some idea of that progress, which our reason would lead us to expect, and which a number of local indications attest at every step*.

During five days that I spent at the house of judge Powel, who has a seat four miles from the Plato, I had leisure to visit the chasm at a place where there is a kind of large bay in one of it's sides (k). This bay is remarkable for a great eddy, that carries into it most of the floating substances brought down by the cataract, and confines them there. At this place we perceive, that the river, stopped by the hardness of the rock, has carried it's fall to several points, till, finding out the weakest, it continued it's course by this.

Here, as well as at the breach in the Plato, the

* It is to be wished, that the government of the United States, the present head of which is a friend to the arts and sciences, would cause a very precise description of the present state of the cataract to be drawn up. This would become a valuable document, with which it's progress from age to age might be compared, so as to appreciate with certainty the changes that might take place in it.

stratum of rock at the surface is calcareous; and we may reasonably presume, that it is the same throughout the whole course of the chasm, since the bed of the cataract is so likewise, and of the kind called primitive, or crystallized limestone. Dr. Barton, who has examined it more at leisure than I could, estimates it's thickness at sixteen feet: and he believes this stratum of limestone rests on strata of blue schist, containing a large proportion of sulphur*. I found many of these schists on the borders of Lake Erie, and it is probable, that the same strata form it's bed and that of the river Niagara. Some ages hence, if the river, continuing it's operations, cease to find the calcareous rock that checks it, and meet with softer strata, the fall will ultimately arrive at Lake Erie; and then one of those great desiccations will take place, of which the valleys of the Potowmack, Hudson, and Ohio, afford us instances in times past. This grand event may be accelerated by the assistance of causes, that appear to have been very active in forming the structure of the whole country; I speak of volcanoes and earthquakes, the physical traces and historical remem-

* It remains to be known, whether the caverns be in a stone of this nature: an attentive examination of the sides of the chasm would afford information in this respect, which I have not had time to acquire.

brances of which are found in abundance throughout the Atlantic Coast, as I shall presently have occasion to observe more at large.

The fall of Niagara is unquestionably the most prodigious in all this country; but several others are mentioned worthy the attention of the natural philosopher, either for their magnitude, or for their height.

On a continuation of the same hill from which the Niagara precipitates itself, and likewise on the south side of Lake Ontario, the river Genessee has two or three falls, which taken together equal that of Niagara, and prove, that the slope preserves it's level with remarkable regularity. I say two or three, because travellers differ in this respect, and as I have not seen them myself, I cannot resolve the question. Arrowsmith reckons but two, of which that nearest the lake is 75 feet high, the other 96, making together 171 feet.

Mr. Pouchot, a French officer, who was in Canada in the war of 1756, reckons three falls*; the first 470 feet [2 *arpens*] broad, and 64 feet high; the second very inconsiderable; the third 700 feet

* See *Mémoires de M. Pouchot*, Yverdun, 1781: Vol. III, p. 159. He calls this river Casconchiagon, which is it's Canadian name.

[3 *arpens*] broad, and 107 feet high; making the whole height, omitting the second cascade, 171 feet, as Mr. Arrowsmith does, who reckons only two.

Bougainville, the celebrated circumnavigator, who was also employed in the war of 1756 in Canada, in his manuscript journal, which he has shown me, estimates the second fall at 21 feet; which would make the total height 192. Now the fall of the Niagara is 153 feet, and the slope of the rapids preceding it about 50, making together 203*.

Thus the difference is only eleven feet: and if we consider, that these elevations vary according to the periods of low water and floods, it must be allowed, that measures taken at different times by different persons could not easily accord better.

Below Quebec, on the north bank of the St.

* See the American Museum, Vol. VIII, p. 215, where an anonymous writer, who appears to have taken accurate notes respecting the Niagara, thus estimates all it's descents.

1st,	the fall of the rapids	58 feet,
2d,	the height of the cascade	150,
3d,	the slope of the chasm down to the Plato, a distance of 7 miles	65,
	Total	273 feet.

Lawrence, a river of middling size forms a cascade celebrated under the name of the Falls of Montmorenci. This cascade is 235 feet high, and about fifty broad; and it's effect is extremely picturesque, from the white and snowy appearance it assumes in this enormous fall.

Above the same city, on the south bank, is the fall of another river, called the Chaudiere: this is not half the height of the preceding, but it is 240 feet broad or more*.

A third fall, named the Cohoez, is that of the Mohawk, three miles before it's opening into the Hudson. The name of Cohoez appears to me an imitative word retained from the savages; and, what is singular, I have found the same word in the country of Liege applied to a little cascade eight miles from Spa. The Cohoez of the Mohawk is estimated by some at sixty-five feet, by others at fifty only: the sheet of water is near three hundred yards wide, and is broken by several rocks.

A fourth fall is that of the Potowmack at Matilda, six miles above Georgetown, about 77 feet high, and 8 or 900 broad. The river, which to this place flows through a valley skirted with hills, wild as those of the Rhone in Vivarais, falls at

* See a particular description of these two falls in Weld's Travels, Vol. I, p. 357.

once, like the Niagara, into a deep chasm of solid rock, consisting of a micaceous granite, each side of which is perpendicular. It escapes from this some miles farther down by a widening of the valley in the lower country.

Several other falls beside these are mentioned, which are remarkable rather for their height than for their body of water: such as that of Falling Spring, on one of the upper branches of James River, coming from Warm Spring. Mr. Jefferson, who mentions it in his notes in Virginia, estimates it at two hundred feet high; but it is only fifteen broad.

Such too is that of Passaik*, in New Jersey, which is upward of 70 feet high, and about 120 broad. As to that called St. Anthony, in the Missisippi, above the river St. Peter's, I shall only say after Mr. Arrowsmith, that it is twenty-nine feet in height.

Europe affords nothing that can be compared with these grand phenomena of nature, except the cataract of Terni, in Italy, and that of Lauffen, below Schafhausen, where, according to Mr. Coxe,

* Liancourt mentions it by the name of Patterson, and Chatellux by that of Tottahaw.

(Patterson is the name of a manufacturing town lately built at the falls. Totowa was a village near the same place. T.)

the Rhine throws itself down seventy or eighty feet. This gentleman observes, that the sheet of water is broken by large masses of rock, which is a motive in addition to it's height for comparing it with the fall of the Potowmack. As to the cascade of Terni it is the highest of all, since it is near seven hundred and fifty feet, but the body of water is not very considerable. The other cascades of the Alps and Pyrenees do not deserve mentioning after such grand objects; and now we are accurately acquainted with the cataracts of the Nile, once so vaunted, and know them to be in reality nothing more than rapids, falling when the river is low from four inches to twelve at each shelf of granite, we have a fresh proof of the exaggerating spirit of the Greeks, and their slight acquaintance with geography and natural history.

CHAPTER VII.

Of Earthquakes and Volcanoes.

Though the north part of America has not been known to us two centuries, this interval, so short in the annals of Nature, has already been

sufficient, to convince us by numerous examples, that earthquakes must have been frequent and violent there in times past; and that they have been the principal cause of the derangements, of which the Atlantic Coast presents such general and striking marks. To go back no farther than the year 1628, the time of the arrival of the first English settlers, and end with 1782, Mr. Williams, to whom we are indebted for some curious researches into this subject, has found authentic records of more than forty-five earthquakes in this period of 154 years; and the particulars, which he has given in several papers*, establish the following general facts.

'That the earthquakes were preceded by a noise resembling that of a violent wind, or of a chimney on fire: that they threw down chimneys, sometimes even houses, and burst open doors and windows: that they dried up wells, and even several rivers: that they imparted to the waters a turbid colour, and the fetid smell of liver of sulphur, and threw up out of great chinks sand with a similar smell: that their shocks seemed to proceed from an internal focus, which raised the earth up from below, and the principal line of which, running north-east and south-west, followed the course of

* See the American Museum, Vols. III and V.

the river Merrimack, extending southward to the Potowmack, and northward beyond the St. Lawrence, particularly affecting the direction of La ke Ontario.'

Some of the phrases here employed are remarkable for the analogy they bear to local facts, that I have mentioned. Did not that smell of liver of sulphur, imparted to the water and sand vomited up from the bowels of the earth through great chinks, originate from the stratum of schist, which we found at Niagara beneath the limestone, and which, when subjected to the action of fire, emits a strong smell of sulphur ? It is true, this is but one of the elements of the substance mentioned, but an accurate analysis might detect the other. This stratum of schist is found under the bed of the Hudson, and reappears in many places in the States of New York and Pennsylvania among the sandstones and granites; and we have reason to presume, that it exists round Lake Ontario and beneath Lake Erie, and consequently that it forms one of the floors of the country, in which is the principal focus of the earthquakes.

The line of this focus, running north-west and south-east, particularly affects the direction of the Atlantic to Lake Ontario. This predilection is remarkable on account of the singular structure of this lake. The rest, notwithstanding their magni-

tude, have no great depth. Lake Erie no where exceeds a hundred, or a hundred and thirty feet; and the bottom of Lake Superiour is visible in many places. The Ontario, on the contrary, is in general very deep, that is to say, upwards of forty-five or fifty fathoms: and in a considerable extent no bottom could be found with a line of a hundred and ten fathoms, with a cannon ball to sink it. This is the case in some places near it's shores; and these circumstances pretty clearly indicate, that the basin of this lake was once the crater of a volcano now extinct. This inference is confirmed by the volcanic productions already found on it's borders, and no doubt the experienced eye will discover many more; by the form of the great talus, or slope, that surrounds the lake almost circularly, and announces in all parts to the eye, as well as to the understanding, that formerly the flat of Niagara extended almost as far as the middle of Lake Ontario, where it was sunk and swallowed up by the action of a volcano then in it's vigour. The existence of this subterranean fire accords perfectly with the earthquakes mentioned; and these two agents, which we find here united, while they confirm on the one hand that of a grand subterranean focus at an unknown but considerable depth, afford on the other hand a happy and plausible explanation of the confusion of all the strata of

earth and stone, which occurs throughout the Atlantic coast. It explains, too, why the calcareous and even granitic strata there are inclined to the horizon in angles of 45° and upward as far as 80°, as their fragments must have remained in the vacuities formed by the vast explosions. To this fracture of the stratum of talcky granite are owing it's little cascades: and this fact indicates, that formerly the focus extended south beyond the Potowmack, as this stratum does. No doubt it communicated with that of the West India islands. I have said in another place, that there are no traces of these earthquakes in the Western Country, and that the savages there have not even a name for them. According to doctor Barton, they are equally ignorant of volcanoes, of which in fact no vestiges are to be seen south of the lakes, though many occur in the Alleghanies. I was told at Fort Detroit, that the savages in the north of Canada speak of a volcano in the interiour part of the country, which still at times emits smoke; but this fact requires confirmation.

It is to be wished, and we have reason to hope, that in course of time learned societies, formed in the United States, will apply to geological researches of this kind both attention and funds beyond the abilities of individual foreign travellers. We may affirm beforehand, that they would obtain

the knowledge of facts altogether new to us, and highly valuable with regard to the history of the Globe; and that they would prove to demonstration a conjecture already formed by several natural philosophers, of the truth of which I am perfectly convinced, that the continent of North America was not disengaged till after South America and the greater part of our hemisphere from the water, either fresh river or oceanic, by which the whole of our planet was once covered to a height above the summits of the tallest mountains, and this for such a length of time, as was sufficient for the solution of those substances, that crystallized after the waters had evaporated or retired. But I have said enough of the nature of the soil; it is time to speak of that of the climate.

CHAPTER VIII.

Of the Climate.

BY climate*, if we adhere to the literal signification of the word, we should understand only

* The greek word *klima*, signifies nothing more than a degree or step. [The author here appears to confound κλιμα, a region, shore, tract of land, derived from κλινω, to lie in an inclined position, with κλιμαξ. T.]

the degree of latitude of a country: but since, generally speaking, countries are hot or cold according to their latitude, the secondary idea has become so intimately associated with the primitive, that the term *climate* is now synonymous with that of the *habitual temperature* of the air. It is not true, however in fact, that the temperature is essentially determined by the latitude: on the contrary, numerous instances prove it to be modified, nay even it's nature to be changed, by the different circumstances of the soil; such as it's surface being dry or watery, woody or bare, high or low with respect to it's elevation above the level of the sea; it's aspect; and more particularly by the kind and quality of it's currents of air, or the winds that sweep it's surface. Hence it follows, that the soil becomes an essential constituent of the temperature, and consequently of the climate, in the sense in which we understand the word; and the account I have to give of the phenomena of that of the United States will afford fresh proofs of this truth.

§ I. *The Climate of the Atlantic Coast is colder in winter and hotter in summer than those under the same parallel of latitude in Europe.*

Natural philosophers, as well as the historians of America, have long ago remarked with sur-

prise, that the climate of the Atlantic Coast was several degrees colder in winter than that of the same parallels in Europe, or even of Asia and Africa on the basin of the Mediterranean sea: but they appear to me, not to have paid attention to a second circumstance equally remarkable, which is, that the temperature in summer is generally several degrees hotter there. I will give examples of both cases at length.

In the northern parts of New England, in the mean latitude of between 42° and 43°, observations made at Salem near Boston during the space of seven years by Mr. Edward Holyhoke*, and compared with twenty years observations collected at Mannheim†, show the climate of Salem to be both colder in winter and hotter in summer than that of several cities in Europe, as may be seen in the following table:

	Latitude.		Maximum of cold.	Maximum of heat.	Scale of variation.
Rome	41°	53′	0	24	24°
Marseilles	43°	17′	4	25	29°
Padua	45°	22′	10	29	39°
Salem	42°	35′	19½	31½	51°

By this table it appears, that at Salem the dif-

* See Transactions of the Philosophical Society of Philadelphia, vol. i. 4to.

† See Ephemerides Meteorologieæ Palatinæ, Mannheim,

ference between the extremes of heat and cold is 51°, while at Rome it is only 24°, at Marseilles 29°, and at Padua 39°.

In general, in the states of Maine, Vermont, New Hampshire, and even Massachusetts, all situate between the latitude of 42° and 45°, that is corresponding to the south of France, and the north of Spain, the ground is sufficiently covered with snow for three or four months in winter, to render the use of sledges general and habitual. The thermometer, which varies at that season from the freezing point to 8° or 10° below, sometimes falls to 12°, 14°, and even 18° below o. Mr. Belknap, the historian of New Hampshire, has seen it at 18¼° at Portsmouth, on the coast north of Salem: and the historian of Vermont, Mr. S. Williams, has seen it 26° below o at Rutland*, at the foot of the Green Mountains.

A little farther north, that is to say in Canada, in the latitude of 46° and 47°, which corresponds to the middle of France, the snow commences with the month of November, and continues till toward the end of April, or about six months of the year, from four to six feet deep, with a very clear sky, and a very dry air. It is so particularly in the neighbourhood of Quebec, where the ther-

* Lat. 43° 39′ 30″, T.

mometer commonly falls to 20° or 24° below the freezing point; and in 1790 the cold was even so intense as to freeze quicksilver, when it must have been at 38° or 40°*: but such a circumstance never takes place in Europe, unless in the parallels of Stockholm and Petersburg†, or in the latitude of 60°.

These degrees of cold have given rise to some curious experiments on the expansive force of water at the instant of congelation. Major Edward Williams, being at Quebec, filled iron bombshells with water, and stopped up the orifice with wooden plugs driven in very tight, and exposed them to the frost. When the bombshells had flaws, or other defects, they burst at the instant of congelation, and prominences in the shape of wings or fins were suddenly projected: but commonly the wooden plug was forced out with an explosion, and impelled to different distances from sixty to 415 feet, though it weighed two pounds and half, and in it's place was always found a salient piece of ice from six inches to seven and half long.

* Liancourt's Travels, Vol. II.

† The mean cold of Petersburg from 1772 to 1792, according to the academy of sciences in that metropolis, was 24½°: but this does not inform us what was the maximum. The frosts began the 27th of September, and ended the 25th of April, as at Quebec.

From these experiments it was concluded, that water in freezing expands a seventeenth or eighteenth of it's bulk.

I shall hereafter observe, that at Montreal, above Quebec, the snow does not continue so long by near two months as at the lower part of the river; and that at Niagara, considerably above Montreal, it's duration is still two months shorter than at this city. This is precisely the reverse of the general rule of elevations, which is observed on the rest of the coast: but at present I shall content myself with pointing out this singularity, which in a subsequent part of the work will be adduced in proof of a theory that I shall lay down.

In these very states, of Maine, Vermont, New Hampshire, &c., the intensity of the heat, reckoning from the summer solstice, is equally excessive. For forty or fifty days the quicksilver is frequently seen to rise to 21° and 22°, and sometimes to 24°, or even 26°. There are few years in which it does not rise as high as 30° and 31° at Salem, which is the temperature of the Persian Gulf and the coasts of Arabia. It is equally intense in many other parts of New England, where observations have not been made: at Rutland, already mentioned, Mr. Williams has seen the quicksilver at 27°. But what will appear more surprising is

that at Quebec, and even as far north as Hudson's Bay, at Prince of Wales and York forts, in the latitude of 59°, a heat from 28° to 31° is experienced for twenty or thirty days, which is so much the more oppressive as the body is not accustomed to it, and it is accompanied with a dead calm, or a hot and moist breeze from the south which is suffocating. Now as in winter the thermometer in these countries falls as far as 30° and 32° below the freezing point, and even to 37° at Prince of Wales Fort, we have here a scale of variation from heat to cold of 60° or 66° of Reaumur.

In the middle states, as the south part of New York, all Pennsylvania, New Jersey, and Maryland, the winters are shorter, and the snow less copious and less permanent, seldom continuing more than fifteen or twenty days; but the cold is neither less rigorous nor less piercing. It commonly sets in about the winter solstice, and continues severe for six or seven weeks, but it begins to be felt as early as the end of October.

At Philadelphia for instance, in the latitude of 39° 55′, which answers to that of Madrid, Valencia, Naples, &c., the thermometer is several days every winter at 8° and 10° below ⊙, and sometimes down to 12° or 14°: nay two winters following, those of 1796 and 1797, I saw it as low as 17° and 18° several days successively.

The cold is at these times so piercing, that, notwithstanding the motion of a tide that rises and falls six feet, the Delaware, which is here a mile broad, is frozen over in twenty-four hours: and it continues thus obstructed for twenty, thirty, and sometimes forty days, but at two or three different times; for every winter there are two or three thaws, particularly between the thirtieth and fortieth days after the solstice. In 1788 the thermometer fell in one night, that of the 4th of February, from $2\frac{1}{2}^{\circ}$ below 0 to $16\frac{1}{4}$, and the river was frozen hard by the evening following. In 1764, between ten o'clock at night on the 31st of December and eight o'clock the morning following, it was frozen so hard, that people could walk across it. In this almost sudden conversion from a fluid to a solid, a smoke or vapour, says Dr. Rush, was seen to rise from it's surface in such abundance, that the people assembled in astonishment, to contemplate the phenomenon.

From the time of the summer solstice, however, and even for twenty days before, the heat at Philadelphia is so oppressive, that the streets are deserted from noon till five o'clock, and most of the inhabitants retire to rest after dinner. The thermometer frequently rises to 25°; and one or two instances of it's being at 28° and 30° are mentioned. Between the night time and the day

it will vary 8°, that is from 15° or 16° to 22° or 23°. But what renders the heat most insupportable is the almost total want of wind, particularly from three o'clock in the afternoon, and the moisture with which the air is loaded on all this coast.

From these extremes we have a scale of variation for the Middle States of 46° or 48°. Dr. Rush was one of the first who observed, that the climate of Pekin was most analogous to it; and on pursuing the comparison we find, that North America has striking resemblances, not only in climate but in soil, with the north of China, and the adjoining country of Tatary.

In the southern states, as Virginia, the Carolinas, and Georgia, the duration and intensity of the cold diminish in pretty regular proportion to the latitude. The course of the Potowmack, or more precisely that of the Patapsco, forms a striking line of demarcation in this respect. Here the domain of snow terminates, and the traveller coming from the north, who had hitherto seen sledges at the door or in the court of every farm, perceives not another after he has descended the steep hill, at the foot of which the Patapsco flows; but inland, toward Blue Ridge, the snow prolongs it's limit a little; in consequence of the elevation of the ground. This coast however has pretty sharp at-

tacks of frost in the forty days succeeding the winter solstice. At Norfolk, on the 14th of February 1798, a snow four feet deep fell in one night; and even at Charlestown, in the latitude of 32°, that is in the parallel of Morocco, the quicksilver falls to 2° below 0, according to Liancourt, and the ground freezes hard to the depth of two inches in a single night *.

On the contrary on all the coast beyond the Potowmack, the heat, from a month before the summer solstice, is so great, that during the space of four months the quicksilver commonly rises in the afternoon to 22° or 24°, notwithstanding a gentle seabreeze. It rises even to 32° and 33° at Savannah; which is much higher than in Egypt, where 25° is the common term in the shade; not to mention, that a constant brisk wind and very dry air contribute to render this degree of

* This circumstance prevents the orange tree from growing there in the open air; but it will not obstruct the cultivation of the olive, a valuable present of Mr. Jefferson to this country: particularly if it were the Corsican olive; for in 1792, I saw in the mountains of that island, at Corte, which is eleven hundred yards above the level of the sea, olive trees in a flourishing state, notwithstanding a cold of three or four degrees below 0. The Corsicans even say, that if the snow lie a week on the ground at their feet, it destroys the insects, and ensures the crop.

heat supportable there. On the 17th of july 1758, Mr. Henry Ellis observed the quicksilver at 31° at Savannah; and he complained, that for several nights it did not sink below 29°. In his cellar it stood at 21°*, and under his armpit at 29°. Dr. Ramsay, who made a series of observations at Charlestown, saw it rise to 28½ only once in five years: but Charlestown, built at the mouth of a little river agitated by the tide, enjoys the sea-breezes, and has so much the reputation of a cool place, compared with the rest of the country, that all the planters in easy circumstances repair thither in summer, leaving only the negroes on their estates.

From these facts we have for the Southern States a scale of variation of 32° or 34°; and no doubt the reader has observed, that this scale is in a decreasing ratio from north to south. It was 66° at Hudson's Bay; 51° in Massachusetts; 48° in Pennsylvania; is reduced to 35° or 36° in Carolina; and, if we were to proceed farther toward the tropics, we should find in many places only 18° or 20° of annual variation. At Martinico, for instance, Porto Rico, and others of the Windward Islands, the thermometer, owing to the prevailing breezes, does not rise higher than 28°,

* See the American Museum, Vol. V, p. 151.

or fall lower than 10° above 0. On the chain of mountains in the province of Caraccas, in the latitude of 10° north, at an elevation of more than a mile and half above the level of the ocean, the quicksilver fluctuates between 10° and 21°, above 0, at Surinam, near the seacoast, it's range is from 15° to 27°. Accordingly travellers coming from these latitudes in summer find the heat grows more insupportable as they proceed northward; and for my part I would prefer the heat of Cairo to that of Philadelphia, beyond all comparison. It is true, that on approaching the Alleghanies, and still more on ascending their summits, the air, being brisker and more elastic, renders the heat more agreeable, though there it is frequently scorching. But in general in what are called the temperate zones, particularly in low and damp places, it is more disagreeable than in what are termed hot countries: and it is also a fact, that the climate is more equal in the torrid zone, than in the temperate zones; and would be more favourable to health, and to the vital power, were not the air frequently corrupted by the exhalations from stagnant waters, and from substances in a state of putrefaction; and did not foreigners, in particular Europeans, carry with them that greediness of animal food, and abuse of

spirituous liquors, which heat will not allow with impunity.

The English and American meteorologists, who, conformably to the national genius, reduce every thing to direct and systematic calculations, when they mention these extremes of heat and cold, are accustomed to deduce from them a mean term, to which I cannot subscribe. For instance, having assumed 19° below the freezing point and 31° above it as the extremes of temperature at Salem, they find the sum on adding them together to be 50°; and taking the half of this, or 25°, which gives 6° above 0, as the mean term, they suppose 6° to be the fundamental and habitual temperature of the country. This method they equally apply to the daily variations of temperature; and if, as frequently happens in the United States, there be 8°, 10°, or 12° of variation in the four and twenty hours, they in like manner take the mean term as the temperature of the day. But in reality this fictitious temperature does not take place: because, in the course of the same day, the air changes so suddenly, that it passes from one extreme to the other without stopping at the mean term; and throughout the whole year this pretended mean term perhaps does not occupy a hundred hours. This ap-

plication of arithmetic is a little less erroneous, when they sum up the number of hours or days that a given wind prevails; but when such tables are not accompanied with the state of the thermometer corresponding to the prevailing wind, the greater part of the instruction we should reap from them is lost, because we are left unacquainted with the nature and effects of each wind, and of the causes of the variations of temperature, in which we shall soon see they are the principal, if not the sole agents.

A better mode of estimating the fundamental temperature of a country would be that proposed by Mr. Williams, who takes as the basis of this temperature the natural and permanent warmth of the earth, the measure of which he seeks in the air and water, either of wells or of the deepest caverns, and on this occasion he mentions facts, that deserve to be noticed *.

At Rutland in Vermont he found the temperature of wells, at the depth of 45 feet, $5\frac{1}{4}°$ of Reaumur - - - $5\frac{1}{4}°$—44° Fah.
In different places in Massachusetts $7\frac{1}{2}°$—49°
At Philadelphia - - - $9\frac{1}{5}°$—53°
In Virginia, according to Mr. Jefferson †, it is - - - 11°—57°

* History of Vermont, p. 42.

† See Notes on Virginia, p. 33.

At Charlestown, according to Dr. Ramsay, it is - - 14°*—63°

In this table we see a gradation proportionate to the parallels of latitude, which agrees with the experiments of Mr. de Saussure, to refute the old doctrine of a mean temperature of 10° throughout the globe, and to prove, that the heat of every place is in the ratio of the latitude, or more precisely of the action of the Sun on the ground, to which heat is imparted by it's rays.

§ II. *The daily Variations are greater and more abrupt on the Atlantic Coast than in Europe.*

The excessive variations on the Atlantic Coast, of which I have been speaking, are not confined to the seasons; they take place likewise from one day to another, nay very frequently in the course of the same day. This is observed particularly in the Middle States, as Maryland, Pennsylvania, and the south part of New York; and more in the flat country than on the mountains: no doubt because these Middle States, placed between two opposite atmospheres, that of the pole and that of the tropics, are the theatre of the perpetual con-

* Humboldt found the same degree in South America.

test between the large masses of cold air and hot.

'It appears that the climate of Pennsylvania,' says Dr. Rush, 'is a compound of most of the climates in the world. Here we have the moisture of Britain in the spring, the heat of Africa in summer, the temperature of Italy in june, the sky of Egypt in the autumn, the cold and snows of Norway, and the ice of Holland in the winter, the tempests (in a certain degree) of the West Indies in every season, and the variable winds and weather of Great Britain in every month of the year.'—*American Museum*, Vol. VII, p. 337.

'In the course of our winters,' the doctor farther observes, 'particularly in January and February, there frequently happen variations of 14°, 18°, and even 28° of Fahrenheit, from cold to hot, or from hot to cold, in less than eighteen hours, by which the health is considerably affected. In four and twenty hours between the 4th and 5th of February 1788 the mercury fell from 37° to 4½° below 0, a difference of 41½°. At other times the south and south-east winds, bringing on a heat of 54° or 58°, occasion a sudden thaw; and this temperature, continuing for some days, has been known to induce premature vegetation, and occasion peachtrees to blossom in the month of February; but as the cold does not really finish before April, frosts never fail to come on

with north-east and north-west winds, reproducing the alterations I have already mentioned.

'Similar variations take place in summer, and piercing cold succeeds almost every night the violent heats of the day. It is even observed, that the higher the mercury rises in the afternoon, the more it falls in the morning at daybreak, for these are the two extremes of heat and cold. After a day in which the mercury has stood at 86°, and even at 90°, it sometimes falls in the course of a single night to 65°, or even 60°. The mercury from 80° generally falls to 68°; while it descends, when at 60°, only to 56°. These falls of the quicksilver occur particularly after storms of rain and thunder: in the summer of 1775, on such an occasion, it fell 20° in the space of an hour and half. In general there are few evenings on which a fire would not be agreeable, except during the months of july and august. These variations are not so striking in Upper Pennsylvania, toward the sources of the Susquehannah, and on the plains of the Alleghanies. There the cold in winter is more settled, the heat in summer is less intense, and no doubt the quality of the air renders it more supportable than in our lower country, where the atmosphere is moist and dense.'—Ib. Vols VI and VII*.

* In these two paragraphs I have been obliged to translate Mr. Volney, who has merely given the sense of various

What Dr. Rush here says of Pennsylvania, which is equally applicable to the southern part of New York, to New Jersey, and to Maryland, is applicable with very little difference to the coast of Virginia and the Carolinas. In the city of Charlestown variations of 8° or 10° of Reaumur are frequently experienced in a single day, both in winter and summer. There are instances of 12° or 15°, and Dr. Ramsay mentions one of 22° in less than fifteen hours. The 28th of october, 1793, the thermometer fell from 18° to 3° above 0, a difference of 15°, within ten or twelve hours†.

Henry Ellis, after complaining of the summer heat at Savannah, adds:

'I have observed, that all the changes and variety of weather, that happen in the temperate zone throughout the year, may be experienced at Hudson's Bay in twenty-four hours. But I may now extend this observation; for in my cellar the thermometer stands at 81°, in the next story at 102°, and in the upper one at 105°: yet these heats violent as they are, would be tolerable, but for the sudden changes that succeed them. On the 10th of december, 1757, the mercury was at 86°: on the 11th, it was so low as 38°; a difference of 48°'.— *American Museum*, Vol. V, p. 152.

scattered passages: at the same time I have adopted the words of the original, wherever I could. T.

† Liancourt's Travels, Vol. IV.

The countries to the north are not less exposed to these vicissitudes, but there is this difference, in the Southern States the sudden variations are chiefly from hot to cold, while in the Northern they are more frequently from cold to hot; so that in the latter the effects produced on bodies generally arise from dilatation, in the former they are commonly owing to constriction. In Bougainville's manuscript journal I find facts of this kind, that deserve to be mentioned.

'December the 11th, 1756, Quebec. Within these three days the thermometer has risen from 19° below 0 to the freezing point. To day it rains and thaws, with a southerly wind, and the weather is as sultry as in spring.

'December the 14th, afternoon. The wind has just changed to the north-west: it begins to freeze hard: the thermometer is $3\frac{1}{2}$° below the freezing point. The next day, the 15th, the quicksilver is at 21°, the wind has changed from north-west to south-west, the sky is beautifully clear.

'January the 18th. The wind is north-west, the thermometer 27° below the freezing point: the weather clear, and prodigiously cold: travellers arrive with their nose, fingers, and toes frost bitten: the cold is less intense in the lower town than in the fort, the elevation on which this is built ex-

posing it to the north-west wind, from which the town is sheltered.'

At Hudson's Bay similar facts are mentioned by Umfreville and Robson, observers equally accurate and judicious. They remark, that for the twenty or thirty days which the summer heats continue, the nights frequently remain pretty hot: but during winter the southerly winds bring those transitions from 18° and 20° below the freezing point to 0, which occasion that sensation of sultriness complained of by Bougainville: a sensation that appears strange to us, who when the thermometer is at 0 shiver with cold; but which is in fact the same thing, as when with us the quicksilver rises from 0 to 15°, or when an African experiences a transition from 20° to 30°, it being in each case the effect of comparison. It is likewise in consequence of this habit of the organs of sense, that at Charlestown people complain of the cold, when the thermometer is but 10° or 12° above the freezing point; and that as much wood is burnt there, according to the remark of Liancourt, as at Philadelphia, where the quicksilver falls 15° lower.

On comparing the thermometrical tables of the different places of which I have just been speaking, and in making daily observations myself on the variations of the atmosphere, I could not avoid perceiving a constant harmony between these va-

riations and certain winds, which are uniformly connected with them. The transitions from cold to heat I always found took place with changes of the wind from north-east or north-west to south-east or south: and on the contrary the transitions from heat to cold always occurred with changes of the wind from south or south-east to north-east or north-west: and this was the case from Florida to Canada and Hudson's Bay. Hence we have one element of a theory applicable to all the problems of this climate; but as good theories are nothing but a systematic arrangement and combination of all the facts of one kind, I shall not be in haste to solve these problems by isolated facts, but shall proceed to bring forward many singularities, which at first sight would appear to be exceptions.

§ III. *The Climate of the Basin of the Ohio and of the Mississippi is less cold by three Degrees of Latitude than that of the Atlantic Coast.*

This is one of those singularities, that deserves so much the more attention, as I do not know that it has ever yet been described with all it's circumstances. For the principal fact I shall borrow the words of Mr. Jefferson, in his Notes on Virginia, p. 125.

'It is remarkable, that, proceeding on the same

parallel of latitude westwardly, the climate becomes colder in like manner as when you proceed northwardly. This continues to be the case, till you attain the summit of the Alleghaney, which is the highest land between the ocean and the Missisippi. From thence, descending in the same latitude to the Missisippi, the change reverses; and if we may believe travellers, it becomes warmer there, than it is in the same latitude on the seaside. Their testimony is strengthened by the vegetables and animals which subsist and multiply there naturally, and do not on our sea coast. Thus catalpas grows spontaneously on the Missisippi, as far as the latitude of 37°, and reeds as far as 38°. Perroquets even winter on the Scioto, in the 39th degree of latitude. In the summer of 1779, when the thermometer was at 90° at Monticello, and 96° at Williamsburg, it was 110° at Kaskaskia.'

As a traveller I can confirm and enlarge upon the assertion of Mr. Jefferson. In the journey I made in the summer of 1796 from Washington on the Potowmack to Fort Vincents on the Wabash, I collected notes, of which the following are the principal results.

1796, May the 5th, the first strawberries at Annapolis, on the shore, and at the level of the sea.

May the 12th, the first at Washington, where the land is somewhat higher.

May the 30th, the first at Fredericktown, at the foot of Blue Ridge, about a hundred and twenty feet above the level of the sea. (Here cherries do not ripen better than at Albany, a hundred and forty miles farther north, but on the level of tide-water.)

June the 6th, the first strawberries in the valley of Shenando, west of Blue Ridge, and perhaps three hundred yards above the level of the ocean.

July the 1st, at Monticello, the seat of Mr. Jefferson, the wheat harvest commenced on the lower slopes of South-west Mountain, facing the south and south-east, while on their backs, having a north-west aspect, toward Charlottesville, it did not begin till the 12th or 14th.

July the 10th, harvest at Rockfish Gap, on the summit of Blue Ridge, at an elevation of eleven hundred and fifty feet. It was two days earlier in the valley of Staunton, about 230 feet lower.

July the 12th, harvest on Jackson's Mountains, an elevation of more than 2200 feet.

July the 20th, harvest on the Alleghanies, at the elevation of 2600 feet.

In this ascending line we find it uniformly more backward in proportion to the height of the level.

On descending the other slope of the Alleghanies, that to the west, I found, that at Green Briar, situate in a low plain, it took place five days earlier, or the 15th of july.

In the valley of the Great Kanhaway, at the mouth of Elk river, it began on the 6th.

At Gallipolis, a French settlement on the Sciota*, on the 11th.

At Cincinnati, farther north, on the 15th.

I found no wheat at Fort Vincents on the Wabash, where a preference is given to Indian corn, tobacco, and cotton, products characteristic of a hot country.

On the 1st of july harvest had commenced at Kaskaskias on the Missisippi, as it had done at Monticello.

This second line from the Alleghanies does not exhibit the same regularity in appearance as the preceding; no doubt in consequence of the diversity of levels, aspects, and even of latitudes, which here vary more. For instance, if Cincinnati be not so forward as Gallipolis, it is because it lies a little farther north, and in addition is less sheltered

* Founded in consequence of the proceedings of the Sciota company, which made so much noise at Paris in 1789 by the sale of lands, which it never possessed, but for which it continued to be well paid. I shall have occasion to speak of it again hereafter.

from the winds from that quarter, and less open to the south: if the valley of the Kanhaway, though at a higher elevation, be still more early, it may be owing to it's closeness, the effect of which is to concentrate the heat, which in fact I found greater there than in other places: and in our gardens we have proofs of this effect of different aspects, since our espaliers ripen the same kinds of fruit at different periods eight or ten days apart, according as they have an east, west, or south exposure, and likewise according as they are sheltered from the winds, or affected by reverberation from other walls. It is not the less true, that the law of elevations is generally observed in the line described, and that there is a remarkable coincidence in the time of harvest at Kaskaskias and Monticello, both in the same latitude, and at an elevation which I conceive to be nearly the same.

Still I am far from denying, that in the Western Country, several phenomena of temperature and vegetation occur, which neither the elevation nor the aspect is sufficient to explain. Among the first in rank of these phenomena is one observed within these few years by botanists, which every day confirms: on comparing the places in which certain trees and plants grow spontaneously on the east and on the west of the Alleghanies, they have discovered, that there is a general and uniform dif-

erence equivalent to 3° of latitude in favour of the bason of the Ohio and Missisippi; in other words, those trees and plants, which require a warm climate, and winters less cold and of shorter duration, are found 3° farther north on the west of the Alleghanies, than to the east on the Atlantic Coast: thus cotton, which succeeds at Cincinnati and Fort Vincents, in the latitude of 39°, has not yet been found capable of cultivation in the Carolinas farther north than 35° or 36°. It is the same with the catalpa, sassafras, papaw, pacan or Illinois nut*, and many other trees and plants, a particular enumeration of which would require more skill in this branch of natural history than I possess†.

Proofs of this kind, which are irrefragable, are supported by the phenomena peculiar to each season. Throughout my travels on the Ohio, and at my various stations in Kentucky, at Gallipolis, Limestone, Washington in Kentucky, Lexington, Louisville, Cincinnati, and Fort Vincents, the information I collected uniformly agreed in the following facts.

* A nut of a very long shape, with a fine and brittle shell, and altogether infinitely superiour to the hickories, or woody nuts of the Atlantic Coast.

† Dr. Barton has informed me, that he was preparing a paper on this subject, which cannot fail to be highly interesting.

'The winter does not commence till the approach of the solstice, and the cold weather is felt only in the forty or fifty days succeeding it. Even then it is not fixed and constant, but there are intervals of temperate and warm days. The thermometer does not fall in general lower than 5° or 6° below 0: [21° or 19°] the frosts, which at first show themselves a few days in october, disappear, return again toward the end of november, cease again, and do not become settled till toward january: the brooks, little rivers, and standing waters, then freeze, but seldom continue frozen over more than from three to fifteen days.

The winter of 1796, when the quicksilver fell to 15° below 0, and the rivers Alleghany, Monongahela, and Ohio, were frozen over from the 28th of november to the 30th of january, a space of sixty-five days, was considered as an instance without example. The Wabash is frozen almost every winter, but continues so only from three to fifteen days. Throughout Kentucky and the basin of the Ohio the snow commonly remains only from three to eight or ten days; and even in the month of january there are days really hot, the thermometer being at 15° or 18°, [66° or 72°] with a south or south-west wind, and a clear bright sky. Spring brings on rain and showers, with north-east and north-west winds; but within forty

days after the equinox the heats begin to set in. 'They are in all their intensity during the sixty or seventy days that succeed the summer solstice. The thermometer then keeps between 26° and 27° [90° and 93° F.] In 1797 it was observed at Cincinnati and Lexington at 29° [97° F.] During the whole of this time storms occur almost daily on the Ohio, producing an oppressive heat, which is not tempered by the rain: sometimes they are brought by the south and south-west winds, at others they are produced by the evaporation from the river and the vast forest, with which the country is covered. The rain, which falls in torrents, cools but for a moment the burning soil; and the heat of the next day, raising it in vapour, forms in the morning thick mists, which are afterward converted into clouds, to renew the electric process of the preceding day. The water of the river is at 14° or 15° above 0 [64° or 66° F.]. The nights are calm, and it is not till between eight and ten in the morning, that a slight breeze comes on from the west or south-west, which ceases about four in the afternoon.'

Throughout the year the prevailing wind is the south-west; being the current that ascends the course of the Ohio, and comes by the way of the Missisippi, where it's prevailing direction is south, from the Gulf of Mexico. I found this wind hot

and stormy the moment I entered the valley of the Kanhaway, the temperature of which no doubt it increases, as it is checked there at the foot of the mountains: it changes it's direction according to the windings of the Ohio, and sometimes it would be considered as west, or south; but always preserving it's identity it prevails ten portions of time out of twelve, leaving only two for all the other winds together. It is equally prevalent throughout Kentucky, but does not there produce the same effects; for while the valley of Ohio, to the breadth of twelve or fifteen miles, has abundant rain and moisture, the rest of the country is parched with droughts, which continue sometimes for three months; and the farmers have the vexation of seeing from their hills an aerial river of fogs, rains, and thunder-storms, winding like that on the Earth, the basin of which they never quit.

At the autumnal equinox rains come on with winds from the north-east, south-east, and *even north-west.* The coolness these occasion prepares the way for frosts: the whole of the autumn is serene, temperate, and the most pleasant of the three seasons of the year; for throughout the *continent of North America* there is *no spring.*

Such is the climate of Kentucky and all the basin of the Ohio. You must go very far north to perceive any considerable difference in it, and

particularly to find it in harmony with the same parallels on the Atlantic Coast. Even as high up as Niagara it is still so temperate, that the cold does not continue with any severity more than two months, though this is the most elevated point of the great platform; a circumstance totally inconsistent with the law of elevations.

The descriptions that have been given me of the winter throughout Genessee do not correspond with the coldness of this season in the parallel of Vermont, or of New Hampshire, but rather with the climate of Philadelphia 3° farther south. In the latter city it has been remarked as singular, that frosts occur there in every month of the year, except july; and to meet with a place similarly circumstanced in Genessee, we must go as far as the village of Oneida, in the latitude of 43°; while on the east of the mountains, at Albany, no month of the year is exempt from frost, and neither peaches nor cherries will ripen.

Lastly at Montreal, in the latitude of 45° 20°, the cold is less severe, and of shorter continuance, than in that part of Maine and Nova Scotia, which is east of the mountains; and the snow does not remain on the ground at Montreal so long by two months as at Quebec, though it is higher up the river; which also is contradictory to the law of

elevations, and indicates some other cause, that remains to be discovered.

Before I proceed to this I shall add a few more observations, and some facts, which will serve to prepare the way for it's better explanation.

1st, It follows from the comparisons I have given, that, to measure the different degrees of temperature of the United States, two grand thermometrical scales, crossing each other in opposite directions, must be applied to the whole country; one placed in the natural direction of the latitudes, having it's maximum of cold toward the pole, for instance, at the river St. Lawrence, and it's maximum of heat toward the tropics, as in Florida: between these two extremes, under equal circumstances of elevation and aspect, the heat increases or decreases regularly according to the latitude. The other scale, placed transversely from east to west, in the direction of the longitude, is a thermometer with two inverted stems, having a common bulb, or maximum of cold, resting on the Alleghany mountains, while the extremities of it's two stems proceed one east the other west, to find their maximum of heat on the Missisippi and the shore of the Atlantic; and on each the degrees of heat are measured by the combined ratio of the elevation and aspect. Without attention to these

complex rules, it is impossible to frame a good general table of temperature and vegetation for the United States: the sketch we find of one among the papers of the society at New York is ingenious, and may be of use; but, to fulfil it's purpose with accuracy, it requires the adoption and application of the principles I have just laid down.

2d. The difference of climate on the east and west of the Alleghanies is accompanied with two circumstances of great importance, which I believe have not been remarked. The first is, that beyond the latitude of 35° and 36°, as you proceed southward, this difference ceases, and the temperature of the Floridas and the west part of Georgia, from the Missisippi to the river Savannah and the ocean, is subject to the same common law; so that the chain of the Alleghanies, and the turn of the Apalachians, form the actual boundaries of the difference on this side, and thus show themselves to be one of it's efficient causes.

The second circumstance is, that this excess with regard to temperature ceases again almost suddenly between the latitudes of 43° and 45° north, toward the great lakes. Scarcely have you passed the south shore of Lake Erie, when the climate grows colder every minute in an astonishing proportion. At Fort Detroit it still resembles that of Niagara, it's parallel; but from Lake St. Clair,

the settlers find the cold much more severe, and of longer duration, than at Detroit. This little lake remains frozen over every year from november to february; the south and south-west winds, by which the temperature at Lake Erie is rendered more mild, are here less frequent, and no fruits but winter pears and apples will ripen.

At Fort Michillimakkinak, two degrees and a half farther north, observations made in 1797, under the direction of the American general Wilkinson*, show, that from the 4th of august to the 4th of september, the thermometer in various places beyond Lake St. Clair never was higher at noon than $16\frac{1}{2}°$ of Reaumur [70° F.], and that in the morning and evening it frequently sunk to $5\frac{1}{2}°$ [46° F.], which is colder than at Montreal, under the same parallel.

These facts accord perfectly with the general results, lately published by Mr. Alexander Mackenzie in his interesting account of his travels in the west and north-west parts of America. During my stay at Philadelphia I had an opportunity of becoming acquainted with this respectable traveller, and obtaining from him much information on this subject. One of his compa-

* See Medical Repository of New York, Vol. I, p. 530, where is a meteorological table, drawn up by major Swan. [In the 2d edition, which lies before me, it is p. 519. T.]

nions, Mr. Shaw, whom likewise I was so fortunate as to meet with in 1797, and who returned from a residence of thirteen years at the remotest posts, where he had been engaged in the fur trade, was equally obliging in answering my questions; and from their united information it appears:

'That setting out from Lake Superior, proceeding west to the Stony or Chipewan mountains, and travelling north as far as 72°, the country, now well known to the Canadian traders, displays a climate, that for severity of cold can be compared only to Siberia. That the ground, generally flat, bare of trees, or exhibiting only a few here and there of stunted growth, interspersed with lakes, marshes, and a prodigious number of streams, is incessantly swept by violent icy winds, coming from the northward, and particularly from the north-west. That from the latitude of 46° the earth is frozen *during the whole year*. That at several trading posts, between 50° and 56°, it was found impracticable on this account to have wells, though very necessary. That Mr. Shaw himself had attempted to dig one at the post of St. Augustin, about forty miles from the mountains; but though it was in the month of july, the ground was frozen at the depth of three feet from the surface; and as it grew harder and

harder, when he had penetrated to the depth of twenty feet he was obliged to give up the attempt.'

These facts cannot be questioned, both from the character of the narrators, and the support they receive from other similar accounts. Robson, an English engineer, who in 1745 constructed Prince of Wales's Fort at Hudson's Bay, in the latitude of 59°, ingenuously and with surprise relates: that, having attempted to sink a well in the month of september, he first found thirty-six inches of earth thawed by the preceding warm weather, then a stratum of eight inches frozen as hard as a stone; and under this stratum a sandy friable earth, frosty and very dry, in which his borers could not find water, because he observes the continual cold, freezing the superficial waters, prevents them from penetrating below the point, where the heat of summer is capable of thawing them*.

Edward Umfreville, who was a factor of the Hudson's Bay company from 1771 to 1782, and a very sensible and accurate observer, equally attests, that the ground in those countries, even in the midst of summer, when the heat is in-

* An account of six years residence in Hudson's Bay. 1752.

tense for four or five weeks, thaws only about four feet, where it is cleared of wood, and it's surface exposed to the rays of the sun; and not more than two feet where it is shaded by the sorry juniper trees and pines, that constitute the whole vegetation of the country*.

* Present State of Hudson's Bay. 1790. The same facts occur on the continent of Asia, and confirm the analogy of climate and soil I have pointed out. Gmelin, Pallas, and Georgi attest, that beyond the latitude of 65°, and even of 60°, in Siberia, marshes are found eternally frozen at bottom: the ice of which has preserved from ages unknown the bones and even skins of elephants, rhinocerosses, and mammoths. See *Le Nord Literaire*, No. 1, p. 380.

The celebrated American traveller Ledyard also affirms, that at Yakoutsk, not so high as the latitude of 62°, well water cannot be obtained; 'for it is found by experiment, that the water freezes at the depth of sixty feet.' See a letter from Ledyard in the American Museum, Vol. VIII. Captain Phipps too says, that on the 20th of june 1778, in the latitude of 66° 54', the sea water at the depth of seven hundred and eighty fathoms was at $2\frac{2}{3}$° below 0 [26° F.] One of our own countrymen, Mr. Patrin, a skilful naturalist, who travelled several years in Siberia, relates, that even in the latitude of 54°, having descended a new shaft of the mine of Ildikan in Daourie, in the month of june 1785, he observed at the height of forty feet fissures filled with ice (yet this was a mine of metallic ore); which proves, adds he, 'that the central fire cannot have much energy in Daourie.' *Journal de Physique*, march,

It is evident then, that beyond a certain latitude the climate west of the Alleghanies is not less cold than it's parallels on the east; and this latitude, the mean term of which appears to be about 44° or 45°, taking for it's limits the great lakes, and more particularly the chain of the Canadian or Algonquin mountains, from this very circumstance confines the hot climate of the wes-

1791, p. 256. But as sound philosophy, assisted by all these facts and the ingenious experiments of Mr. de Saussure, has banished to the realms of old mythological fable this ancient dream of a central fire; and even the theory of a mean temperature of 10° [54° F,] advanced without sufficient proof; we have reason to conclude in contradiction to the hypothesis of Buffon and various other natural philosophers, that the globe is a crystallized mass, essentially cold, the surface alone of which is heated by the rays of the Sun, in proportion to the force and continuance of their action. Hence it is, that under the torrid zone we find for a mean term the ground impregnated with heat to about 14° of Reaumur, at a depth which perhaps does not exceed six or eight thousand yards; and in proportion as we proceed from this grand and principal focus toward the north, the heat diminishes in the inverse ratio of the latitude; 11° [57° F.] in Virginia, 9° [52°] at Philadelphia, 7° [48°] in Massachusetts, 5° [43°] in Vermont, 4° [41°] in Canada, and finally 0 [32°] and below 0, [32°] under the pole: so that if ever the Sun should desert our poor planet, it would ultimately become a mass of ice, and white bears and Esquimaux be it's last inhabitants.

tern country to a space of nine or ten degrees, which is surrounded on three sides by mountains. No doubt the presence of these mountains contributes in some measure to this difference: but what is it's chief and fundamental cause? whence arises this truly singular phenomenon in geography? This is the problem to be resolved: and as the comparison of many facts and circumstances has pointed out to me for the principal agent a current of air or wind habitually prevailing in the basin of the Missisippi, the winds of which differ from those of the Atlantic Coast, I conceive it incumbent on me, to furnish the reader with the means of satisfying his judgment, by laying before him the complete system of the currents of air, that prevail throughout the year in the United States.

CHAPTER IX.

System of the Winds in the United States.

In Europe, particularly in France and England, we complain of the inconstancy of the winds, and the changes this occasions in the temperature of the air: but this inconstancy is by no means comparable with that of the air in the United States. I can venture to affirm, that during

a residence of near three years *, I never saw the same wind blow thirty hours together, or the thermometer continue at the same point for ten: the currents of air are perpetually varying, not one or two points merely, but from one quarter of the compass to it's opposite; from north-west to south and south-east, from south and south-west to north-east: and these changes attract notice so much the more, because the alterations in the temperature are as great as they are sudden. On the same day, in winter, there will be snow in the morning, and the thermometer at the freezing point, with an east or north-east wind; toward noon, the thermometer will rise to 6° or 7° [45° or 48° F], with the wind at south or south-east; and in the evening it will be 1° or 2° below 0 [30° or 28°] with a north-west wind: in summer, about two o'clock in the afternoon there may be a calm, with the thermometer at 24° or 25° [86° or 88°]; a storm will come on with a south-west wind; about four or five it will rain; by six or seven the wind will get round to the north-west, blowing violently and cold, as it usually does; and before midnight the quicksilver will be down to 16° or 17° [68° or 70°.] Autumn alone, from the middle of october till near the middle of december, ex-

* From october 1795 to june 1798.

hibits a few days in succession with a westerly wind and a clear serene sky; a kind of weather the more remarkable from the unfrequency of it's occurrence. This changeableness of the air is increased by it's taking place on a vast extent of country, the same winds displaying themselves almost at the same time throughout the whole extent of the Atlantic Coast, from Charlestown to Newport, or even Halifax, and from the seashore to the Alleghany Mountains. Not but there are partial breezes, that affect certain situations, and certain positions of the Sun above the horizon, in all the maritime parts of the country: I only mean to say, that commonly the winds in the United States blow over a very extensive surface, and are much more *general*, than they are in Europe.

Such is in particular the character of the three principal winds, the north-west, south-west, and north-east, which in the United States appear to have shared the empire of the aerial regions between them. If we suppose the year to be divided into thirty-six parts, we may say, that these three have taken to themselves thirty or two and thirty; the north-west and south-west twelve each, the north-east and east six or eight: the rest are distributed between the south-east, south, and west. Due north may be reckoned almost as nothing.

Each of these winds being accompanied with particular circumstances, and becoming successively the cause and effect of considerable and different phenomena, I shall proceed to the particulars necessary to make known their respective course.

§ I. *Of the North, North-east, and East Winds.*

Of all the winds that occur in the United States none is so rare as due north. From the meteorological tables, which I have had an opportunity of consulting at Boston, Philadelphia, and Monticello, it does not blow eight days throughout the year in these latitudes. To the southward it seems to be more frequent, from the observations made at Williamsburg, and quoted by Mr. Jefferson*: but beside that these too summary observations may be considered as vague, it is probable, that this northern direction at Williamsburg is local, and occasioned by the situation of this city on a stream of water running due south into James River. Many of these cases occur, where a wind blowing generally over the country is turned from 30° to 80° out of it's course by the basin of a river, a ridge of mountains, a forest,

* See Notes on Virginia, p. 127.

&c. Thus much at least however is certain, from all the information I could collect, both on the east and on the west of the Alleghanies, a due north wind is of all the least frequent in the United States *.

When it does occur, it is rather moist than dry, rather cloudy than clear, and always cold.

This unfrequency of the north wind seems at first view to contradict the general theory of winds, which explains their whole mechanism by the action of the Sun on the Earth's atmosphere; the unequal dilatation, which the solar rays occasion in different parts of it; and the conflict that takes place between the heavier masses of cold air, and the lighter masses of warm air, to establish that equilibrium and level, which are constant and imperious laws of the state of fluidity: whence it follows, that the atmosphere is continually agitated by currents moving in different directions, and that the cold dense atmosphere of the north must exert an habitual pressure, and have a constant tendency to expand itself, and be carried toward the hot dilated air of the tropics.

* The tables of Dr. Ramsay of Charlestown fully confirm this assertion; for during four years, from 1791 to 1794, they give but four days on which a north wind blew. In the year 1792 it did not blow a single day, and it is equally rare at Quebec.

But, beside that this general mechanism is subjected to certain geographical circumstances, we shall have an opportunity of seeing in the course of this chapter, that the present case does not even constitute an exception to the principle, and that the debt of the north wind is fully paid by two of it's collaterals, the north-west and north-east, which draw their stores from the same source*.

* The reader has perhaps already seen, or may consult a sketch of this theory, in the 20th chapter of my Travels in Syria, published in 1787. A novice at that time in this branch of science, I was ignorant that it had occupied the attention of great masters, such as Halley and d'Alembert. On my return from America, when I was desirous of resuming the thread of my ideas, and expanding them agreeably to the new facts I had collected, it was incumbent on me to make myself acquainted with the knowledge that had been obtained by others; and I found, that the chevalier la Coudraye, in an essay entitled *Théorie des Vents*, 'Theory of the Winds,' had executed the task I had proposed to myself. This essay, which obtained a prize from the academy of Dijon in 1785, is a complete treatise on the subject, and I cannot do better than recommend the perusal of it to those, who would wish to have a concise idea of the formation of currents in the atmosphere. Not but much remains to be said on the general system of winds throughout the globe, and many experiments and calculations on the focus, stratum, and velocity of each current of air; on the different and frequently contrary directions they pursue in the aerial ocean; on the thickness of their strata; on the formation, composition, and dissolution of clouds; on the causes and effects of the more or less

North-east Wind.

The north-east wind, like most others, as it changes it's country, alters it's character, or at least it's qualities. In Egypt, where it bears the name of *gregale*, I found it cold, cloudy, and oppressing the head with it's heaviness: in the Mediterranean, it was rainy, louring, and squally: in France, particularly north of the Cevennes, we complain of it as the dryest of all winds: in the United States, on the contrary, it is held in aversion as the wettest, and one of the coldest. The problem of these differences or contrasts is resolvable with facility by an inspection of the map of the World. In Egypt the north-east wind comes from the north of Syria and the chain of Mount Taurus, which runs through Armenia to join that of Caucasus, and is covered with snow for several months in the year. The current of air proceeding thence has

sudden condensations that accompany storms; &c. But as such an undertaking requires a combination of the united sciences of the navigator, the natural philosopher, and the chemist; and would demand long and expensive researches, pursued on a systematic plan; my task is naturally reduced, to the furnishing of my contingent of materials for the work: and this is what I am about to perform, by exhibiting in the following chapters those facts, that have appeared to me most certain and important.

no time to take up moisture during it's short passage over the extremity of the Mediterranean; and retains it's original coldness, and for the greater part it's drought. As we sail westward, this same current of air, which from Asia Minor declines gradually to the Archipelago and the peninsula of Greece, becomes more temperate; and as it afterward traverses the Mediterranean obliquely, and in a broader part, it there acquires more moisture and humidity, ultimately becoming rainy, as on the coast of Spain.

In France, south of the Cevennes, the north-east wind, blowing over the Alps, must be dry and cold; but it rarely occurs, because a collateral wind, the *mistral* of the Provençals, usurps it's place. North of the Cevennes this wind does not reach us till it has traversed one of the longest lines of continent, crossing Russia, Poland, and the north of Germany; and evidently in this long passage there are sufficient reasons for it's being dry, cold, and of long duration, as we experience it. If we deviate from this line a little to the north, it assumes a different character for the coast of Sweden, where it becomes very rainy, not only because it crosses the slope of the Baltic Sea and Gulf of Bothnia; but because it comes from the sea of Archangel, and the marshy soil of Finland imparts to it moisture instead of drying it. By a

fresh contrast the coast of Norway, immediately at the back of that of Sweden, while it still finds it cold, has it no longer wet; and for this reason, because the chain of the Dofrine Hills, running almost north and south between the two countries, stops the clouds, and robs of their rain the current of air that brings them*.

In the United States the north-east wind comes over a great extent of sea, the surface of which, reaching to the pole, is uninterruptedly saturating it with cold and moisture. Accordingly it displays these two qualities in an eminent degree on all the Atlantic Coast: you need not consult the clouds, to see whether it be blowing; before it arrives you may foretel it's coming within doors by the deliquescent state of your salt, soap, sugar, &c. The sky is soon overcast; and the clouds, if there were any, presently form but one, dark and extending as far as the eye can reach. In the winter, or even if the season be approaching to cold, this vast cloud falls in snow; and if the air be hot, it descends in unceasing rain. From Cape Cod to the banks of Newfoundland the north-east wind drives on the coast the coldest and most benumbing fogs I ever felt. It is for the physiologist to explain

* See in the appendix a letter on the system of the winds of these two countries.

why at Philadelphia, as at Cairo, this wind affects the head with a painful sensation of heaviness and compression: this at least is certain, in both these cities I could tell as soon as I awoke whether the north-east wind blew, equally well before I saw the sky. Now if such a disposition of body, or any other of this kind, be the necessary consequence of a given state of the atmosphere, does it not follow, that the air exercises a great influence on our physical and moral faculties, as the greatest of physicians has so well observed in his treatise on Airs, Waters, and Situations? and is it not to causes of this kind we must ascribe the striking difference, that exists between certain nations; some having generally a lively wit, with a quickness and facility of conception; while of others the understanding is heavy, and the perception dull and slow *?

The qualities of the north-east wind on the Atlantic Coast naturally diminish in intensity as we proceed southward, but they are perceptible even in Georgia; and from Quebec to Savannah the name of this wind excites the ideas of cold, wet, and disagreeable.

But on crossing to the west of the Alleghanies this language is changed: there, to the great asto-

* 'Bæotium crasso jurares aere natum,' said a philosopher and poet.

nishment of those who emigrate from Connecticut and Massachusetts, the north-east and east winds are rather dry than wet, rather light and pleasing than heavy and disagreeable. The reason is, because there, as in Norway, these currents of air arrive after having passed a rampart of mountains, where in a lofty region they deposit the vapours, with which they were loaded. Accordingly it is but seldom and by accident, particularly in summer, that they convey the wished for rain to Kentucky and the banks of the Ohio: but, when they do, it continues at least four and twenty hours, and sometimes three days together; because a considerable vacuum in the air of the basin of the Missisippi is requisite to determine the irruption of the Atlantic atmosphere, and the sun must return once if not more above the horizon, for the heat of it's rays to restore the level of these two great aerial lakes. These ruptures of equilibrium are more frequent during winter, on account of the tempestuous state of the atmosphere both on the sea and on the continent; at which time it is no rare occurrence for the north-east and east winds to cross the Alleghanies, and pour on the Western Country a deluge of rain or snow: but their perpetual antagonist, the south-west, which prevails in that country ten months out of twelve, soon expels them from it's domains, and drives them back to the mountains.

If by chance they counterbalance each other, their double current finds no issue, but by ascending vertically to the upper regions of the atmosphere, where they reciprocally turn back, and glide off horizontally, or descend again into the lower strata; but sometimes the south-west is victorious, and pursues it's way as far as the ocean; at other times the north-east is superiour, and proceeds in triumph to the Missisippi and the Gulf of Mexico. It is at the equinoxes in particular, that the conflict is violent, and the irruption impetuous. The Sun then passing the equator, by cooling one of the poles which it quits, and warming the other which it illumines, occasions a general movement of counterpoise in the aerial ocean; and ruptures of equilibrium take place between opposite masses, and antagonist currents, the consequences of which are most violent and most extensive. Hence it is chiefly at this period, and in the months of april and october, that these hurricanes arise, which in the United States are most commonly produced by the north-east wind. These hurricanes have this peculiarity, their fury is commonly displayed in a narrow space, little more than half a mile broad, sometimes less, and only four or five miles in length. In this space they tear up by the root the trees of the forest, and make openings through the woods, as the sickle of a reaper would in pass-

ing over a few furrows in a corn-field. At other times, but these are rare, they traverse the whole length of the continent, from circumstances which I shall have occasion to explain, when I come to the article of the south-west wind.

The frequency of north-east winds on the Atlantic Coast may be ascribed in part to the direction of the shore and the mountains of that country, which favours the course of the aerial current. Observations made at Monticello, Fredericktown, and Bethlehem, prove, that frequently some other wind blows inland, when it appears to have been north-east at Newport, New York, Philadelphia, and Norfolk, by observations made on the same day. Sometimes this wind itself gives evident proofs of it in it's course, by covering the sea-shore with snow, which does not extend ten miles from it. This occurred at Norfolk on the 14th of february 1798, when in a single night more than forty inches of snow fell in that city and it's environs, with a north-east wind; while five and twenty miles inland it had not even rained, and the wind was rather north-west, as several of the newspapers observed. If the north-east wind change, or alter it's direction, it is commonly to get to the east, which may be considered as it's complement and natural alternative. Less frequent than the north-east, it shares it's cold and rainy qualities, particu-

larly north of 40° or 41°: on proceeding southward it becomes more temperate, without ceasing to be wet, which circumstance explains itself, from the temperature of the sea and those latitudes. It is not to be confounded with the trade-wind of the tropics. This never reaches farther north than 30° or 32°; and so far only when the Sun, at the summer solstice, draws on this side the zone of air it governs, by producing a focus of attraction in the northern parts of that continent. In winter the easterly trade-wind retreats to the latitude of 22° or 23°, being repelled on the one hand by the cold atmosphere of North America, and attracted on the other by a new focus established in South America by the sun, at that time vertical in Paraguay. In either case, even when the irregular north-east and east winds prevail in the Atlantic, they are almost always separated from the trade-wind by a boundary either of calm, or of counter-currents, which occasions their inequality of temperature, density, and velocity. There is likewise this mark of distinction between them: the continental north-east and east winds, in spite of the irregularity of the whole system of their zone, have a tendency to appear at each equinox during the forty or fifty days that follow the Sun's passing the equator. Accordingly this season is the most favourable for sailing from Europe to America; and

merchant ships avail themselves of it, as earlier or later they would be exposed to a long voyage, on account of the south-west and north-west winds prevailing on the Atlantic, the one in winter, the other in summer, and in all seasons allowing only short and interrupted appearances of the south and south-east winds, to which I shall now proceed.

§ II. *South-East and South Winds.*

The south-east wind in the United States resembles in many respects the sirocco of the Mediterranean, which also flows from the south-east. Like this it is hot, moist, light, rapid; and it affects the head with a painful sensation of heaviness and compression, though in a degree infinitely more supportable than the sirocco.

If it be considered, that the *kamsin*, or south wind, produces the same sensation in Egypt; that in other countries, as at Bagdad and Bassorah, it is a south-west wind; and that in all it is uniformly the effect of a current of air, which has swept the surface of a burning and dry soil: it will be natural to conclude, that this physiological effect is owing to the action of some quality or peculiar combination of caloric, or the igneous fluid, on our nerves. The difference of intensity existing between these several winds itself favours this induction; for if, as is the fact, the American south-

east wind be less insupportable than the Italian, it may be ascribed to the long passage of the former over the Atlantic, the humidity of which has neutralized the exhalations of the African continent; while the sirocco has not had time to acquire all this advantage on the narrow basin of the Mediterranean; though it possesses it in a greater degree than the kamsin and the south-west wind of Bagdad, which traverse only continents. Now if such be the physiological effects of certain winds, that they render the body sluggish, the head heavy, and the mind unapt for the exercise of thought*, is it to be wondered at, that in certain parts of Africa, where such a wind is habitual, the aboriginals have really contracted that indolent habit of body and mind, which is observed in some of the negro nations; and that in a succession of generations this habit is converted into nature, which for this very reason may in it's turn be changed by a different habit, arising from opposite circumstances?

To return to the United States. When the south-east wind makes it's appearance in winter on the Atlantic Coast, which happens particularly at the approach of the equinox, it sometimes produces temporary thaws, even as far as Canada, that have the unpleasant effect of spoiling the meat, stores of which are provided for five or six months

* The Italians say of a dull book, 'it is a sirocco performance.'

in cold countries as early as october. Farther south these thaws treacherously deceive the vegetative faculty, calling forth in january or february those flowers, which should not appear till after the equinox, and which the unfailing return of frost inevitably destroys.

Toward the equinoxes, more particularly the vernal, the south-east wind produces short but violent tempest, especially at the mouths of the Hudson and Delaware, and in the Bay of Chesapeak. The duration of these is very commonly twelve hours; and they have this singularity, that they exert their fury, like a hurricane, on a limited space of ten or twenty leagues long and four or five broad, without the least commotion being perceptible out of this space. I have known two instances of this phenomenon at New York, and one at Philadelphia, where such a violent storm was experienced for twelve hours, that it was supposed all the ships near the coast must be lost: yet twelve hours after many vessels came in, without having handed a single sail, or felt any extraordinary wind.

This violent irruption of a light hot wind is not explicable by the common theory of specific gravities, since every other wind is more cold and dense than the south-east: we must therefore admit the expansion of a considerable mass of this hot air, repelling and driving away the colder air that

surrounds it. The bays and mouths of rivers, where this phenomenon most frequently occurs, being conical or resembling a funnel, accords perfectly with this explanation; for a large body of air, impelled into these funnels, is forced to escape by a channel more and more confined. In these it acts nearly as the waters of a pond circumscribed by high banks, in which narrow outlets are made: where the resistance keeps it in equilibrium, the fluid remains tranquil; but it rushes with impetuosity to the point where a deficiency is produced; and this impetuosity is occasioned by two causes, the pressure it experiences on the one hand, and the greater space into which it expands itself on the other, as it issues from it's narrow channel. In the case in question this void space is necessarily in the middle region of the air, at an elevation of less perhaps than a thousand yards, and the torrent from the south-east pours into it by ascending, like all masses of heated air: there it is either condensed by the stratum above, which is at the freezing point; or gliding underneath it escapes horizontally, and perhaps is bent back on itself, forming an eddy, the centre or axis of which is in the air, at the height of five or six hundred yards, while it's circumference sweeps the earth. But what is the primary cause of this vacuum, produced without thunder or any other preceding meteor, at least without any having been perceived? To re-

solve this problem, all the circumstances of the phenomenon must be collected; the manner in which it acts, at least in different points of it's sphere of action and circumference, must be known; and the state of the air, with the direction of the wind, both before and after, must be ascertained: but as I do not possess these data, I shall not attempt to supply their place by mere hypothesis.

Of the South Wind.

When the wind blows directly from the south, we should suppose it would be hotter than from the south-east, yet in the United States it is more temperate. During the summer, when it most frequently occurs, it is considered as an agreeable breeze, and almost cooling, in consequence of the moist vapour, with which it impregnates the air. This vapour I found both at New York and Philadelphia, as well as at Washington, had in a striking degree the smell of sea-marshes, such as oysters have, which indicates it's source in a manner less agreeable than could be wished. It cannot however be denied the merit of tempering the excessive ardour of the Sun, and the still more scorching reverberation from the earth, in the months of june, july, and august. It is for the sake of en-

joying this breeze, that a south aspect is preferred for a house throughout the American continent, as in France we have a preference for the east and south-east. In the United States it has this advantage, that in summer the Sun is so high above the horizon, as not to enter apartments shaded by porticoes or piazzas, the use of which is general. In winter, being lower, it's desirable rays enter the houses, and cheer them with their warmth, in spite of the north-west wind, that too frequently accompanies it's shining. In this season, if the south wind be sometimes a little cold, it is in consequence of having passed over the snow, which occasionally covers the ground for a short time, even in Carolina. And if at other times it bring snow itself instead of rain, it is because in it's aerial course it meets with clouds from the north-east or east, which had not had time to turn back. But such snows melt immediately, or are changed into rain as they fall. Six hours continuance are sufficient to give the south wind that character of heat and moisture, which it derives from the tropical seas, whence it originates: at Philadelphia, on the 10th of march 1798, I found it impart the temperature of Florida. In summer, when it has more velocity than usual, it presently brings on a storm; and it has been remarked at Louisville, as well as other

places situate on the Ohio, that, if it continue for twelve hours together, thunder will infallibly ensue. Now reckoning it's progress at a mean term of forty-five or fifty miles an hour, a calculation which the experiments made on the velocity of winds render plausible, this is just the time requisite to bring clouds from the centre of the Gulf of Mexico, 10° or 12° distant. The frequency of the south wind at this season proves, that a focus of suction then exists in the north of the continent: but it remains to be known, whether this focus lie beyond or on this side of the Algonquin chain, which skirts the lakes on the north. This cannot be decided but by simultaneous observations on a line extending from the shore of Florida, through Kentucky, Lakes Erie and Huron, and the Algonquin Mountains, to the borders of Hudson's Bay: and these would throw great light on the correspondent actions of the polar and tropical regions of the atmosphere, as well as on the conflict and equilibrium of the north-west and south-west currents, which are the principal winds of the United States.

§ III. *Of the south-west Wind.*

The south-west wind, one of the three most prevalent in the United States, is more frequent there

during summer than winter, and more habitual in the Western Country than on the Atlantic Coast. In winter it seems as if it were unable to pass the barrier of the Alleghanies: and indeed it appears, that the north-west, north-east, and east winds, being at that season more powerful, prevent it's passing the mountains. Sometimes, however, it avails itself of their deviations, or surmounts their resistance, and shows itself on the Atlantic Coast with more impetuosity, and particularly with greater coldness, than are consistent with it's habit and origin. But the reason of this is easily perceived, when it is considered, that it has crossed the lofty region of the Alleghanies, frequently covered with snow during winter, and in the west has found the earth drenched with rain, the evaporation of which could not fail to cool it.

In the spring, become more frequent, it brings itself temporary snows, deluges of rain, and even hail: these however seem rather to belong to the north-east and north-west winds, the clouds of which heaped up on the Alleghanies it turns back, and drives before it. This chain indeed forms the lists, in which these opposite currents of air visibly contend for the mastery. Frequently the observer stationed on the plain may see the clouds marching toward Blue Ridge with an east or north-east wind, perfectly stopping there, and

remaining stationary, then dissolving into rain, or turning back again, driven by the south-west wind, which in it's turn prevails for a few hours. I was a witness of this spectacle the evening I spent at Rockfish-Gap on Blue Ridge, and my host, though he was no natural philosopher, accounted for it very satisfactorily.

It is only about the summer solstice, that the south-west wind prevails on the Atlantic Coast in a manner more constant than any other. There it becomes the principal agent in those storms, which are frequent in the months of july and august, and infinitely more violent than ours in France. The south breeze, customarily setting in about ten or eleven o'clock, gives way to the south-west, which, after the Sun has passed the meridian, covers the sky with thunder-clouds. For two or three hours flashes of lightning of enormous magnitude are followed by prodigiously loud claps of thunder; but before sunset the storm subsides with heavy falls of rain, more or less abundant.

The autumnal equinox brings on a change in the direction of the current of air, and then it's opposite, the north-east, is predominant forty or fifty days, though it does not exclusively prevail. After this period the south-west wind, which had not been completely extinguished, revives, and

shares the remainder of the season with the north-west, that now rouses itself, and with the west, which is the most equable, serene, and pleasant, of all that blow on this continent.

The progress of the south-west in the basin of the Missisippi and Ohio as far as the river St. Lawrence is more regular, and more simple; in few words we may say, that this wind prevails from Florida to the lakes of Montreal during ten months out of twelve. The two months of it's being most rare are those of the winter solstice, during which the north-west and north-east rule the sky. From this period it revives in proportion as the Sun advances toward the zenith, and acquires such power, that in july and august it is nearly as constant in Louisiana, Kentucky, and even as far as Lake Champlain, for forty or fifty days, as the trade-wind is at the equator. It prevails almost equally on the St. Lawrence, and to sail up this river a ship is sometimes obliged to wait a whole month for an east or north-east wind, which after all is of short continuance. It is the south-west wind too, that thaws the St. Lawrence about the 20th of april, as it is the north-west that freezes it at the end of december. The south-west, as well as the south, is the hot wind of Canada, Vermont, and Genessee; but it is very decidedly so only in summer: in other seasons it is

cooler in proportion as the Sun is nearer the horizon, and as the land is less distant from the pole; being hottest as you advance toward Kentucky, Tenessee, and the Gulf of Mexico, which is it's original focus.

From the vicinity of this it raises the temperature of Lower Louisiana so high during the four winter months, that notwithstanding the pretty frequent occurrence of north-north-west and east winds, the sugar cane, particularly that of Otaheite, may be cultivated there. But this favour is dearly purchased by oppressive heat during the four summer months, accompanied with extremely violent and almost daily storms, of the same kind as those that are called white squalls in the West Indies. The monsoon of these storms commences after the solstice, and it's progress deserves attention. At first it is about five in the afternoon, when the suffocating and humid heat has attained it's height, that the stormy clouds arise, and speed their way from the mouth of the river and the south-west part of the gulf. Every day the appearance of these clouds takes place some minutes earlier, so that by the middle of august the thunder is heard about two o'clock in the afternoon; heavy falls of rain precede and follow the tremendous claps; and at sunset all is quiet, the calm returns, aud the sky is sometimes clear, at others obscured by mists which the fervid sunbeams raise from

the vast marshes. The night passes quietly, but fatiguing from it's heat untempered by the least air, and still more from the moschettoes. Next morning the heat increases in proportion to the height of the Sun above the horizon, and the stillness of the air: in the afternoon the crisis of the preceding day commences anew*; the south-west wind drives these stormy clouds up the country to Tenessee and Kentucky, where they meet with others furnished by the rivers, swamps, and lakes; and thus the chain of storms is extended, and prolonged with fresh accumulations of strength as far as Canada.

Now to estimate properly the effects and action of this great current of air on the surface of the soil it traverses, and which serves it in some measure as a bed; to calculate justly the character and strength of the focus whence it emanates, the atmosphere of the Gulf of Mexico; many geographical and nautical circumstances of these latitudes must be recollected. It is to be observed, that the centre of the gulf is immediately under the tropic: that during the six summer months the whole surface of it's waters is exposed to the ac-

* I was favoured with this account by Mr. Power of New Madrid, a naturalized subject of Spain, but an American by birth, who has observed the country like an intelligent man.

tion of a vertical and fervid Sun, exciting an immense evaporation: that during the six winter months the power of this luminary is so great, as completely to prevent frost from approaching this sea: that the shores of Yucatan, Campeachy, Vera Cruz, the Floridas, and Cuba, are known to be insupportably hot: that in fact the heat there must be so much the more intense, because the nearly circular basin of the gulf, being enclosed by land and islands, does not admit a free ventilation: and lastly, that seamen speak of this sea as more abounding in storms, thunder, waterspouts, tornadoes or whirlwinds, suffocating calms, and hurricanes, all of them the natural concomitants of a fiery yet moist air, than any other in the torrid zone.

These circumstances of themselves are sufficient, to account for the qualities we have observed the south-west wind to display on the continent of America: but the observer ought not to stop here; he should still inquire, from what primary inexhaustible source this daily and immense consumption of the aerial reservoir is supplied. Now if he examine the map with an attentive eye*, he will perceive, that the only two mouths or outlets of the gulf are situate between the island of Cuba, and

* See the general map, No. 2.

the peninsulas of Yucatan and Florida: that by the opening on the side of Yucatan, which is the larger of the two, the gulf receives currents of water and air from the Sea of Honduras, which in it's turn receives them from the Caribbean Sea, opening into the Atlantic: that through the channel between Florida and the Bahama islands, the gulf is continually discharging it's waters into the same ocean, and that the access of air into it there is obstructed by a triple chain of islands: he will remark, that both these openings are between the latitudes of 20° and 24° north, and that of Yucatan, by it's direct communication with the Caribbean Sea, in fact opens and extends it's mouth as far as 10°: but he knows, that precisely from the latitudes of 10° to 24° the trade-wind of the tropic blows from the east throughout the year on the Atlantic: he learns from the navigator, that this trade-wind arises eighty or a hundred leagues from the coast of Africa, and traverses the ocean at the rate of about 32400 metres [35434 yards], nearly eight leagues [20 miles], an hour*: that it reaches the chain of the Caribbee Islands in a breadth of about 10°, or two hundred nautical leagues: he conceives, that this enormous flood of air must surmount these islands, as a river does the rocks that lie scattered

* See *Annuaire de la République*, year 6, p. 59.

in it's bed; that it enters the Caribbean Sea, and there, imprisoned between the land of St. Domingo and Jamaica on the right, and the southern continent on the left, it is compelled to pursue it's course through the Sea of Honduras, and finally enter the Gulf of Mexico:—and thus the problem is elucidated and resolved.

In fact it is really the trade-wind of the Atlantic, that, by the course I have described, feeds the atmosphere in the gulf, and produces there most of the phenomena, of which it is the theatre. It enters the gulf with more force, because, after it passes the chain of the Caribbee Islands, it's stream is more and more contracted, and it's strength accumulated within a narrower space: no doubt this chain at first breaks and divides it's current, as rocks and reefs divide a torrent of water, or as the piers of a bridge divide the stream of a river. As happens in currents of water, the aerial stream is diverted into eddies at these islands, which stand in it's course; and is divided and compressed, to make it's way between them. This compression increases it's velocity; and as it issues from between them, it expands itself with more force, and forms eddies in their rear, each current contending for the vacuum there. All this is rendered evident in coasting the islands, by the various directions which the wind assumes nearer them or

farther off, and above or below their emergent masses: it is precisely the same as takes place in a current of water, the levity of the fluid excepted; and an attentive study of all the eddies, that take place under a bridge, or among the rocks of a torrent, gives in miniature an accurate idea of what happens in the present case, and to all aerial currents in general.

It might be supposed, that the trade wind of the Atlantic, when it reaches the Moschetto Shore, would or might cross the isthmus: but, notwithstanding the levity of air, it acts more like water than we should imagine, and does not easily pass out of the channels through which it flows, or the beds in which it merely reposes. Many facts show, that the mountains of the Moschetto Isthmus, which are a continuation of the chain of the Andes, oppose an effectual obstacle to it's passage into the Pacific Ocean. To estimate justly the distribution of air, that is made at this place, two data would be requisite, the precise height of these mountains, and the thickness of the stratum or current of air. Possibly this stratum may be thinner than we should be inclined to conceive, for aerostats have informed us, that the strata of the atmosphere frequently do not exceed two hundred yards, and that they glide one over another sometimes in directions diametrically opposite, so that

in an ascent of 10 or 12 hundred yards two or three different winds may be found. New observations of this kind, in the case of which I am speaking and others similar to it, might render science real services, which aerostats have hitherto promised to little purpose.

As to the transverse chain of the Moschetto Country, let us suppose it's height to be only three hundred toises, or 640 yards, this would stop the current of the trade-wind to an extent more than sufficient for leaving it in all it's vigour: the upper portion, that would escape over the summit of the chain, would be a useless overplus; and there is reason to presume, that this overplus does not exist, for no trace of it is found on the coast of the Pacific Ocean behind these mountains to the west. On this coast the winds pursue a very different course: there are local sea and land breezes, extending several leagues from the shore, independant of every other system than their own: and you must get an offing of near forty leagues before you fall in with the general winds, which often, in summer particularly, blow from the west, and consequently in direct opposition to the trade-wind. These winds prevail from the latitude of 10° to 21°, or quite along the coast of Mexico from Cape Corientes to Cape Bianco on the Costa Rica. It cannot be said, that the trade-wind escapes la-

terally over the isthmus of Panama; since there the winds blow in summer from the south and south-south-west, coming from the Pacific Ocean. Thus it is indisputable, that the Moschetto Isthmus and it's chain, whatever it's height may be, form a line of separation between two different systems of winds.

The trade-wind from the Atlantic, thus obstructed, must however find an issue. That between Jamaica and the Moschetto Shore, being large and open, offers itself in preference to any other. Into this therefore it turns it's current, and enters the Sea of Honduras. Some lateral portions of this wind, skimming the land, appear to detach themselves from the stream: for it is observed by seamen, that from Cape Vela, one point of the Gulf of Maracaibo, the winds vary, and turn off in a line parallel to the principal current, shutting up to the south the gulfs of St. Martha, Carthagena, Darien, and Porto Bello: some are drawn in by the basins of the large rivers, and by the high mountains of Terra Firma, and blow from south-east to north-west: others, blowing west, are real countercurrents, similar to those observed in all rapid streams, and of which the Missisippi affords such strong instances, that they assist in part those who sail up the river: while on the right of the grand aerial current, another detached portion

forms the south winds, that blow in summer from june to august on the south coasts of Cuba and Jamaica. Thus the aerial current, resembling water in this respect also, does not exert it's whole force, except in the free and direct line of it's channel.

At it's entrance into the Bay of Honduras it deviates a little, and becomes south-east: and as it meets with no farther obstacle, it enters the Gulf of Mexico in this direction. I say there is no farther obstacle to it, because the peninsula of Yucatan is a bank of sand, too low to act as one: accordingly don Bernard de Orta, to whom we are indebted for an instructive dissertation on the winds of la Vera Cruz*, observes, that the south-east is the prevailing wind in all these parts.

Now let us imagine a volume of air 90 or 100 leagues broad, by two or three hundred toises high, flowing like a torrent at the rate of 400 toises, or 850 yards, at least, in a minute; and conceive what can become of this immense quantity of fluid, accumulated in the sort of cul-de-sac formed by the circular basin of the Gulf of Mexico. It is evident, that from the compound effect of the curvature of the land that forms it's shore, and the gradual diminution of it's impelling power,

* Inserted in the Supplement to the Mexico Gazette, october the 29th, 1795.

this aerial torrent, considered in the first place as one body, must acquire a rotatory motion, the axis or vortex of which, varying according to certain circumstances, fixes chiefly toward the north of the gulf, whence the surplus flows over the adjacent land: and here is one fundamental cause of all the phenomena exhibited by the air of this spot, and that of the south-west continent, which is derived from it.

Analysing it afterward in detail, this vast current subdivides itself into several branches, which obey the laws of the original stream, combined with the directions local circumstances impose on them.

The first and most lateral of these branches; that which, after having crossed the peninsula of Yucatan, coasts the shore of la Vera Cruz and Panuco; obeying it's primary direction and that given it by the mountains of Tlascala, proceeds toward the interiour of Mexico, and ascends the basins of the rivers Panuco, las Nacas, del Norte or Bravo, and all their branches, as far as the mountains of New Biscay, New Mexico, and Santa Fe. I would venture to say, without knowing the winds of the interiour of those countries, that the most prevalent there are from south to east in all the parts watered by the rivers I have mentioned.

It must be this same branch of the wind, that, when it has reached the mountains of New Mexico, assumes another character, and pouring down on the north-west coast, so ably explored by Vancouver, prevails during summer in the vicinity of Nootka. Captain Meares, who made many good observations there in 1791, represents the south-east wind in that country as violent, tempestuous, rainy, foggy, and *piercing cold.* This is something new with respect to the south-east wind in the northern hemisphere; but it acquires this quality by passing over the ice and snow, that cover the mountains of New Mexico, and are so conspicuous, as to have obtained them, among many other names, those of Icy and Shining. It appears, that these mountains have an elevation not unworthy the chain of the Andes, of which they are a prolongation, and that the Nootka south-east wind owes it's strength to their altitude: for Captain Meares also observes, that farther south the prevailing wind on that ocean, erroneously called the Pacific, blows during summer from the west, as far as the latitude of 30°; 'where begins,' he adds, 'the zone of the eastern trade-wind*': so

* Admiral Anson likewise observed, that in the latitude of 30° and 32° a gentle, pleasant west wind prevailed; but that toward 40° and 45° it became stronger and more constant.

that the parallel of 30° forms the boundary line between two winds directly opposite; a case apparently singular, yet natural and common. This gentle, serene, clear, and fine westerly wind, being the countercurrent of the easterly trade, which is the principal stream, rapid, and almost impetuous, from their friction arise those whirlwinds, variable gales, and calms, which proved so fatal to the ships that first attempted to reach Europe by the way of China, pursuing their course in this latitude.

To return to the Gulf of Mexico. A second branch of the Atlantic trade-wind, within the preceding, and forming the greater part of the current, takes it's course toward the shores of Louisiana and the Floridas. It's direction, as we see, becomes south-west: yet on the Missisippi itself it is rather due south, for those who navigate that river observe, that on it only two winds can properly be said to blow, the south and the north; the reason of which is the same as on all rivers, the direction of the wind being governed by that of it's bed and it's valley. It is natural too, that, before it becomes fully south-west, a portion should turn off to the south, and this portion should prevail in the neighbourhood of Bernard's Bay.

A third branch, turning toward the peninsula of

Florida, endeavours to pass over it, and escape to the Atlantic Ocean: but it is obliged to turn back into the gulf, because it meets with the trade-wind from the east, particularly in summer, when this extends to the latitude of 30° or 32°. The return of this branch, and it's addition to the preceding, constitute one of the reasons, why at this period, that is in july and august, the south-west wind blows with redoubled strength in the United States.

Lastly, the central portion of the great vortex, kept in a kind of equipoise by opposite motions, is the seat and cause of the variable winds, suffocating calms, storms that are the consequences of these, and all the phenomena peculiar to the gulf. These *a priori* reasonings the facts actually recorded by navigators confirm. Don Bernard de Orta, captain of the port of la Vera Cruz, assures us*, that in the south part of the gulf the south-east and east are the prevailing winds, particularly in summer; that in winter they get round as far as north-east, with squalls from the north, short in their duration, but terrible in their effects. Bernard Romans, an English traveller, who in 1776 published a very intelligent and instructive work on the Floridas†, observes, that, in the curve

* In the dissertation already quoted.

† Natural and civil History of the Two Floridas, 1 vol., 12mo, printed at New York, and now very scarce.

connecting the peninsula of Florida to the continent, the prevailing winds, particularly in autumn, are the north-west and west; and these two points are precisely the direction of the current of air as it returns to it's vortex.

Lastly both these writers affirm, as every navigator does, the frequency of waterspouts, whirlwinds, tempestuous squalls, calms, and hurricanes, in this sea.

It has been already observed by some natural philosophers, that a singular correspondence of time and action existed between the hurricanes of the Gulf of Mexico, and those of the continent, even in places far to the north. Dr. Franklin, comparing the times of day at which a hurricane, that traversed the continent from Boston to West Florida in october 1757, was felt at different places, found that the disturbance of the air did not commence at Boston till several hours after the time of it's beginning on the coast of the Gulf, and that from place to place it was earlier or later in proportion to the distance. Thus the hurricane was first felt at the point to which the air was rushing, and terminated at the place whence it proceeded; which at that time, when the subject was novel, appeared only a fortuitous coincidence: but Franklin with his usual sagacity inferred, that the focus of the movement existed

in the gulf, and that it was the effect of a sudden vacuum produced in the atmosphere there, into which the air of the continent rushed to supply the deficiency, first that nearest to it, and in succession from remoter distances.

Subsequent facts have confirmed this first idea, and from time to time fresh proofs of it's truth occur. Almost every year between the 10th and 20th of october a hurricane of twelve or fifteen hours continuance is felt in the north of the United States, and particularly on Lake Erie, with the wind from north-east to north-west; and just at the same time we always read in the news of some hurricane on the coasts of Louisiana and the Floridas, *with northerly winds*. The attraction, or more properly speaking suction, is plainly pointed out: but it remains to be explained how the vacuum is produced, and why in the neighbourhood of the Alleghanies it is the current from the north-east, that is particularly attracted; for this is the most constant agent in the inland hurricanes, whether general or local. On considering the history of winds, and combining the various ideas respecting the mechanism of storms, with which this subject has furnished me, I have conceived, that this curious problem in natural philosophy was not wholly beyond my power to solve.

Chemistry, it is true, has not yet made an analysis of stormy clouds, or their manner of acting on each other: it has not decomposed their constituent parts, so as to make known all the agents and all the effects of their detonations, of the sudden solutions consequent to these, and of the condensations equally sudden by which a very considerable volume of aqueous vapour is reduced to a small volume of water and cold air; but the material facts, and many subsequent to them, are known, and from induction to induction they lead to satisfactory results.

It is known, that there are no clouds without moist surfaces: that clouds are the products of the evaporation of water and the volatile principles contained in it: that this evaporation is copious in proportion to the heat, dryness, and renewal of the air: that consequently cloudy vapours are a combination of the particles of water with those of caloric, or the igneous or electric fluid; for in my conception these three terms express but one principle, either pure or modified. This principle, light and centrifugal by nature, takes up the water, which is essentially heavy, and forms of it, if I may venture to use the term, little balloons, capable of floating or being wafted through the air, and equally electric in greater or

less proportion: thus it may be said, that clouds are a kind of volatile neutral salt, composed of caloric, air, and water, the constituent principles of which become again perceptible by the senses, at the moment of their reduction or detonation; namely, the water in the rain that falls, the caloric in the lightning that flashes and flies off, and the air in some other way less sensible to the eyes. All clouds however are not stormy or thunder clouds: to be such, it appears, they require a stronger dose of caloric, which they are capable of taking up in different proportions: and it seems, likewise, on the sea, the abundance of aqueous fluid, and the temperature, which is there always more moderate than on land in similar states of the atmosphere, do not allow them to saturate themselves so highly with caloric, or to be so stormy or detonant. In fact it is observed by seamen, that in the open sea storms are more rare, and less violent, but occur more frequently and with greater fury on approaching the land. Consequently the intensity of heat, or abundance of caloric, occasioned by the reverberation of the earth, is one determining cause, one constituent principle of storm: to which must be added a number of other matters abounding on land, and rare, if they exist at all, on the sea, as volatile mineral substances, sulphur, and gasses of dif-

ferent kinds, evolved in very considerable quantity from animal or vegetable substances, in a state either of putrefaction or simple maceration. This state particularly occurs in marshy or muddy places, the substance of which is susceptible of a much higher degree of heat than simple water: and this circumstance combines in the most remarkable manner with all the rest in the spot of which we are speaking; for all the Delta of the Missisippi is a land half submerged by water, partly fresh, and partly brackish. All the right or west bank of this river, for four hundred miles in length and fifty in breadth, is drowned every year by inundations: all the north shore of the gulf, from Mobile Bay to St. Bernard's, and even to the river del Norte, an extent of five hundred miles, consists wholly of marshes. Finally the shores of Yucatan, Cuba, Campeachy, and Florida, abound with them; and it is easy to conceive, that all these surfaces, containing many hundreds of square miles, must furnish an enormous quantity of inflammable gas, and other materials of storms.

It is fully demonstrated likewise, that, when clouds differently charged approach each other, and come into contact, an action takes place between them, tending to produce an equilibrium of the electric or igneous fluid and every other gas:

that in this action the electric fluid displays greater velocity than air or water; that from it's extreme tenuity all it's parts mingle together at once, and that their disengagement from every other combination is sudden and simultaneous. In consequence of this disengagement, the water, that was combined with it, is left to it's natural gravity: whence the drops of rain, more or less large, that follow at once the lightning, the flash of which displays the pure igneous fluid at the moment of it's disengagement, and the clap of thunder, the sound of which is produced by the concussion of the air rushing into the vacuum occasioned by the condensation of the vapour, or it's reduction into water. Now if it be considered, that water converted into steam by ebullition is calculated to occupy eighteen hundred times it's former space, and that at a less degree of heat it still occupies more than a thousand: that consequently a cloud of a thousand square fathoms may be suddenly reduced to the space of one, or, to take the very lowest computation, to ten: if it be added, that the velocity of the air rushing into the vacuum is equal to that of a cannon ball, or 460 yards in a second: we shall no longer be astonished at the prodigious force of those gusts of wind, which, under the name of squalls, waterspouts and hurricanes, tear up trees by the roots, overturn

houses, raise up water, and throw over their ramparts four and twenty pounders with their carriages, many instances of which have been seen in the West Indies; and we may conceive, that the sudden formation of vacuums in the air are in reality the common and powerful cause of all the violent commotions in the atmosphere.

These vacuums very well explain the particular case of the hurricanes that occur in the United States with a north-east or north-west wind. For if we suppose, as the fact is, that the same body of air extends from the Alleghanies and Lake Erie to the chain of the Mexican isthmus, it is evident, that, when a considerable portion of air in the gulf is suddenly condensed by a thunder storm, that in the basis of the Mississippi is immediately set in motion, rushing on to fill the vacuum. If in these cases the north-east column is most frequently affected and moved, it is because it's direct opposite, the south-west, is that which becomes deficient and retires, so that under these circumstances the north-east may be said to be the return of the south-west. Indeed all the space I have just mentioned ought to be considered as one and the same lake or ocean of air, having for it's shores and boundaries the chains of mountains and West India islands. The Alleghany chain, forming one of these boundaries

along the whole of the eastern side of this aerial lake, is at the same time the boundary of another, the air on the Atlantic Coast. Now the latter, which is contiguous to the atmosphere of the north and north-east, whence it derives it's supplies, is composed of a cold and dense air, while that of the Western country is hot and more expanded: consequently the Atlantic lake presses incessantly on the Western at their mutual boundary, and from the laws of equilibrium has a constant tendency to flow into it. The moment therefore the habitual effort of the hot and dilated air ceases to support and repel the weight it had to sustain, this weight is set loose, spreads itself by an effort as powerful as natural, and a north-east wind takes place.

I admit however, that the constant recurrence of one of these hurricanes about the middle of october depends on some particular and determinate circumstance. This I imagine I perceive in the general change produced throughout the whole atmosphere by the Sun's passing the equator. While this luminary continued on the north of the line, and particularly while it was in the vicinity of the tropic of Cancer, it's rays, darting on the northern continent, occasioned there great heat; and thus produced a focus of suction, toward which all the aerial currents directed their

course; so that even the atmosphere of the torrid zone was carried toward the polar circle, there checking and contracting the limits of the cold winds of the north. On the contrary, when the Sun has recrossed the line, about twenty or five and twenty days after, that is in the middle of october, it is perpendicular to the widest part of South America. In this situation, heating the amplest surface of that vast continent, it establishes there another focus of suction, which attracts toward it an immense body of air, and thus to a great distance turns from their former direction the currents of air, or winds. The northern atmosphere is then enabled to spread itself again as far as the tropic of Cancer: hence the limits of the trade wind are repelled to the latitude of 20° or even 18°: hence these periodical north-east winds, that blow upon Guiana from the Atlantic, continuing from december to march or april, when the Sun is over Paraguay, and which, after they have discharged their extreme humidity on Guyana, pursue their course over the continent toward the Andes: and hence those winds from the northward, which from the month of october become more frequent in the Gulf of Mexico, and reach the Isthmus of Darien. The Sun's passage to the south of the equator, therefore, is a moment of concussion,

that agitates the atmosphere of both polar circles at once. The first instant one of these changes takes place, the air of the Gulf of Mexico, turning on a sudden toward the south, produces an immense vacuum, into which the air of the basin of the Missisippi pours itself in it's turn; and if we consider, that the term of twelve hours, which is commonly the duration of the hurricanes of Lake Erie, and of these countries in general, is nearly proportioned to the space that requires to be traversed and filled up, the cause to which I ascribe them will be deemed so much the more probable.

Vacuums produced by detonation appear to me likewise the only means of explaining those incomprehensible hailstorms, in which, contrary to all the laws of gravitation, we see pieces of ice weighing several pounds coming from the higher regions of the atmosphere*. The electric explo-

* I had long refused to credit the existence of those hailstones said to weigh ounces and even pounds, of which newspapers and travellers too frequently speak; but the storm of the 13th of july, 1788, afforded me the conviction of my own senses. I was at Pontchartrain, ten miles from Versailles, and, going to see a sheep-walk at six o'clock in the morning, I found the rays of the Sun intolerably scorching: the air was calm and suffocating, that is, it was extremely rarefied: the sky was without a cloud, yet I heard four or

sion having suddenly divested of caloric and condensed an immense body of vapours, the icy air of the higher regions rushes at once into the vacuum, compresses the water, which at the same time it freezes; and by the same sudden exertion of force, that roots up trees and beats down houses, it seizes and transports the frozen masses into the aerial regions. Accordingly we never see a hailstorm without more or less wind, and we may even assert, that the violence of the wind is always proportionate to the magnitude of the hailstones.

five claps of thunder. About a quarter after seven a cloud appeared in the south-west, and then a very brisk wind arose. In a few minutes the cloud filled the horizon, and speeded toward the zenith with an increase of the wind, and a hailstorm suddenly came on, the stones not falling perpendicularly, but obliquely, as at an angle of 45°, and so large, that you would have taken them for pieces of mortar from a roof pulling down. I could not believe my own eyes: many of the stones were larger than a man's fist, and I observed too, that several of these were only fragments of larger pieces. When I could safely venture my hand out of the door of the house, to which I had very opportunely retired for shelter, I took up one, and found it to weigh more than five ounces by a common pair of scales. It's shape was very irregular, and it had three principal horns, as big as the thumb, and almost as long, projecting from the nucleus on which they were collected. I have been credibly informed, that a hailstone at St. Germain weighed more than three pounds, and after this I know not what weight surpasses belief.

A similar mechanism will explain waterspouts, which are a kind of vortices of air and water, commonly seen when the weather is thundery and calm, but never unless it is cloudy. These move or rather run over the sea, and sometimes over the land, in the shape of an inverted cone, the base of which is in the clouds, while it's spiral point pours down a torrent of water, that has sometimes been sufficient to sink a ship. It was once supposed, from their resemblance to fountains, that waterspouts were the effect of submarine volcanoes, throwing up the water as whales do from their spout-holes. It is possible, no doubt, that such cases may have happened; and then the waterspout must have been stationary, and very considerable: but those of which we are speaking being movable, wandering, and even rapid in their course as in their gyration, they must be ascribed to a very different cause. It appears, that, in consequence of the stormy state of the air, and some imperfect detonations, vacuums of less extent, or not so instantaneous, are produced in the middle region of the atmosphere, into which however the clouds are drawn by the influent air: some stratum of the air, being colder than the rest, condenses these clouds, acting as a drop of cold water in the steam-engine, and a process of solution and resolution into rain takes place: but, whether because

the air beneath resists it by it's density or by it's heat, or because the whirling motion of the air overpowers and keeps half suspended the water that would fall, the different threads of this rain ultimately collect below into one bundle, and this bundle assumes the shape of a funnel, the mouth of which is in the dissolving cloud, and the point on the sea, where the water, restored to it's natural weight, is poured out. This figure of a cone or funnel is owing precisely to the same mechanical cause, though in an opposite direction, as the flames of the great fires, of which frequent instances occur in clearing land in the United States. When woods are cut down, that the ground may be brought under cultivation, the trees felled are collected into one heap in the middle of the field, that they may burn the more readily, and not set fire to the trees still surrounding it on all sides. The vast pile, sometimes covering a whole acre of ground, is kindled, and when it is completely on fire, it is observed, that the flames do not ascend separately and perpendicularly, but bend inward and collect in one bundle at the centre of the pile, from which they rise in the shape of a cone, or an inverted funnel, the point of which always pierces the air with the same spiral and gyratory motion as takes place in an opposite direction in the cone of the waterspout: from all

parts of the circumference there is an afflux of air, tending equally to the centre of the pile, the fire of which it feeds; the only difference in the two cases being, that in the waterspout it is a heavy fluid gravitating downward, while in the burning pile it is a light fluid rising upward; each uniting it's parts, to pierce with more facility the obstacle that presses on it, and the pressure of which occasions the spiral figure, and pouring itself out in it's own manner, the one downward, the other into the air.

It is possible too, that a waterspout may be occasioned by the friction of two currents of air in opposite directions, since this friction would be an effectual cause of the gyratory motion: it would be sufficient for one of the two to be colder than the other, that it's clouds might dissolve; but all the other effects and terms of comparison would remain the same.

Recurring to the facts mentioned in the course of this long article, I think I have clearly demonstrated, that the south-west wind of the United States is nothing but the trade wind of the tropics turned out of it's direction and modified, and that consequently the air of the Western Country is the same as that of the Gulf of Mexico, and previously of the West Indies, conveyed to Kentucky. From this datum flows a simple and natural solution of

the problem, which at first must have appeared perplexing, why the temperature of the Western Country is hotter by three degrees of latitude than that of the Atlantic Coast, though only separated from it by the Alleghany mountains. The reasons of this are so palpable, that it would only be wearying the reader to give them. Another consequence of this datum is, that, the south-west wind being the cause of a higher temperature, it will extend the sphere of this temperature so much the farther, the greater the facility with which it can pervade the country; and this affords a very favourable presage for the parts that lie in it's way, and are exposed to it's influence, namely those in the vicinity of lakes Erie and Ontario, and even all the basin of the river St. Lawrence, into which the south-west wind penetrates. A more speedy and perceptible improvement of the climate may be expected in this quarter, than in places much farther south on the other side of the mountains: an improvement which will be felt in proportion as the forests are cut down, that now check the course of the aerial stream. And indeed this cause has already begun to produce the effect, since the period of the river's being shut up by ice is near a month later than when Canada was first colonized; and instead of insuring vessels on condition of their leaving the river by the end of november, as used

to be specified in the beginning of the last century, the clause in the policies is now extended to Christmas-day, or the 25th of december. Unfortunately greater hopes in this respect are powerfully opposed by the north-west wind, the history of which remains for me to give. But before I examine the arguments for and against this melioration of climate, I cannot dispense with a few words respecting a phenomenon intimately connected with the subject I am about to quit, which in our ordinary geographical studies does not occupy the place it merits. I mean the current in the Mexican gulf, well known to the English and Americans under the name of the *gulf stream*.

§ IV. *Of the Current of the Gulf of Mexico.*

The effects of the tropical trade-wind are not confined to the accumulation of air in the Gulf of Mexico. By blowing from the coast of Africa toward that of America, and driving the waves before it in one direction for the space of twelve hundred leagues, the east wind at length heaps up the water in the cul-de-sac formed by the shores of Mexico and Louisiana. It is to be regretted, that we have not in this respect precise data of the height, and that the Spanish government, which

has sometimes thought of forming a communication between the two seas through the Isthmus of Darien, has not caused their respective levels to be taken: but I can assert with nevertheless confidence, that the waters of the Mexican Gulf are actually several feet higher than the space they leave behind them, even setting out from the West Indies, and still more than the Pacific Ocean, which is on the other side. I found this assertion on the analogy of what happens in the Mediterranean, and in lakes and ponds of a certain magnitude, where the winds blowing two or three days from the same point occasion a kind of flood at the opposite extremity two or three feet in height. This effect is very perceptible in the harbour of Marseilles, where I have seen the water raised thirty inches by easterly winds; and the same takes place in an opposite direction with westerly winds, the French engineers having found a variation of 33 inches on the coasts of Syria and Egypt. I will venture to say, that in the present case their rise is much more considerable, in consequence of the force and continuance of the efficient cause; and when I consider that the same French engineers have proved the Red Sea at Suez to be near thirty feet higher than the Mediterranean at Damietta*, I am led to believe something similar

* See my Travels in Syria, 2d edit. [French] Vol. I, p.

takes place in the Gulf of Mexico, with respect to the coast of the Pacific Ocean and that of the United States. But, it will be said, admitting any excess of height you please, the fluid must nevertheless return to it's level somewhere. Undoubtedly it must: but this it cannot by the channel between Yucatan and Cuba, because the double current of air and water sets into this with all it's force. The surplus water, therefore, has no issue left but by the channel of the Bahamas: and in fact it is on this side, that the water, after having coasted the shores of Mexico, Louisiana, and Florida, escapes round the point of the peninsula under the shelter and protection of the island of Cuba and the numerous shoals of the Bahama islands, which on this side break the effects of the ocean, and the current of the trade-wind. The rapidity of the stream in the Gulf of Florida, while it is a fact too well known to be disputed, is a proof of the height of it's source in the Gulf of Mexico. On entering into the ocean it still preserves itself very distinct, not only by the velocity of it's current, which is four or five miles an hour, or greater than that of the Seine, but also by it's colour and

179. When mentioning the opinion of the ancients in this respect, I insisted on it's probability, from the general slope of the land, and the course of the river, and from the action of the wind on fluid surfaces. The fact has confirmed my opinion.

it's temperature, which is from 5° to 10° of Reaumur [11° to 22° F.] hotter than that of the ocean it traverses. This singular kind of river coasts the whole of the United States, varying in it's breadth, which is estimated at fifteen or sixteen leagues at a medium*, and does not lose it's strength and distinguishing characters till it nearly reaches the great bank of Newfoundland, where it spreads as at it's mouth, it's direction there being north-east. That skilful navigator sir Francis Drake first remarked it's effects, and conjectured their cause, toward the end of the sixteenth century; but one of the most curious circumstances, that of the temperature, escaped his notice. It was not till 1776, that Dr. Blagden, making experiments on the temperature of the ocean at different depths, found the thermometer plunged into the sea off Cape Fear, about the latitude of 31° north, after having given 72° of Fahrenheit, on a sudden rose to 78°, continued so for many miles, and afterwards sunk gradually to 69°, and then to 67°, when on approaching the coast they got soundings, and the water became greenish. This phenomenon, at that time a novelty, excited much attention in England, and Dr. Franklin, who made similar observations on his passage to Europe the same year, gave it still more celebrity. His nephew, Mr. Jonathan

* A little farther on it is one degree or twenty nautical leagues. T.

Williams, who accompanied him on that voyage, has pursued the inquiry, and made repeated experiments on the subject; and the following facts may now be advanced as a complete theory.

1st, The gulf-stream pursues a marked course from the Gulf of Florida to the banks of Newfoundland.

2dly, It coasts the shore of the United States at a distance rendered variable by the wind, but which may be estimated on a medium at one degree, or twenty leagues.

3dly, In proportion to it's distance from it's source it increases in breadth, and diminishes in velocity.

4thly, It appears to have hollowed itself out a distinct and very deep channel at the bottom of the ocean; for in it you suddenly lose soundings, or can get no bottom without a very long line.

5thly, It wears the south coast of the United States, notwithstanding the resistance of the shoals of Cape Hatteras, which turn it toward the east a point and half of the compass*, and which it threatens sooner or later to destroy. The sandy

* The sailors say: 'when you are off at sea past the shoals, in fifteen fathoms water, and can just see Cape Hatteras from a sloop's masthead, you are about to get into the gulf-stream, and will immediately lose soundings.'

islands of the Bahamas, the additions of a similar nature to the land on the continent side, and the shoals of Nantrucket, appear to be nothing but depositions from it: and I am tempted to advance, that the banks of Newfoundland are nothing but the bar at the mouth of this vast marine river.

6thly, On each of it's borders, it forms an eddy or counter current, which, assisted on the side of the main land by the rivers of the continent, stops the muddy deposit termed the *soundings*.

7thly, Long continued south-west winds render it less perceptible, because they impel the waves in the same direction; but the north-east winds, as they directly meet it, render it more conspicuous, and cause the sea to run so hollow, as the sailors term it, that a single decked vessel with a deep waist runs the risk of being foundered, by shipping such heavy seas.

8thly, When the colour of the water becomes an indigo blue, instead of the sky blue it has in the ocean, or the greenish or olive hue it has within soundings on the coast, you are in the gulf-stream. This water, seen in a glass, is colourless like that of the sea between the tropics, and more salt than that of the Atlantic, which it traverses.

9thly, Abundance of weeds on the water is not a proof you are in the stream, it is only an indication of it.

10thly, The air is warmer on it than on the ocean: in winter ice on the deck of a vessel entering it melts, you find yourself drowsy, and between decks are suffocated with heat.

Some experiments will give determinate ideas of this difference of temperature.

In the month of december 1789 Mr. Jonathan Williams, sailing from Chesapeak bay, observed, that in the water of the ocean, the quicksilver in the thermometer marked

	Farenheit	Reaumur.
1, In soundings, or the shoal water on the coast - - - - - -	47°	6°
2, A little before entering into the stream - - - - - - -	60	12⅔
3, In the stream - - - - - -	70	17¼
4, Before reaching Newfoundland, in the stream - - - - -	66	15¼
5, At Newfoundland, out of the stream - - - - - - -	54	0
6, Beyond the bank, in the open sea - - - - - - - -	60	12⅔
7, Then on approaching the coast of England it gradually sunk to - - - - - - - - -	48	7⅓
In june 1791 captain Billing, making a voyage to Portugal, observed at his departure, on the coast of America, and in the water within soundings - - - - - - - - - -	61	13
Afterward, in the water of the stream - - - - - - -	77	20

Now this makes a difference of 7° of Reaumur, or 16° of Fahrenheit; but in winter, Mr. Williams found the variation 23° of Fahrenheit, or from 47° to 70°: the difference therefore is less in summer than in winter, as might be expected.

These inquiries have led to another discovery, from which navigators may derive some advantage: by examining the temperature of the ocean in different places, it has been found, that, the shallower the water, the colder it is; and hence has been derived an indication of an approach to the land, or of the vicinity of a shoal. In july 1791 the same capt. Billing observed, that three days before he came in sight of the coast of Portugal, the thermometer sunk in a few hours from 65° to 60°, and this difference occurred precisely on the boundary between the depths of the unfathomable ocean and the soundings that skirt our continent. Mr. Williams likewise observed in the month of november on another voyage, that on approaching the coast of England the thermometer fell from 53° to 48°; and he remarked, as well as captain Billing, that, if the thermometer sink suddenly at sea, it indicates a shoal underneath the water, either because the earth beneath the sea is colder than the water itself*, or because the cooling effect of

* The learned traveller Humboldt, to whom we are indebted for so many new and important observations, like-

evaporation is more perceptible in shallow than in deep waters.

What I have said of the course of the gulf stream affords a satisfactory explanation of two incidents in natural history worthy of remark on the coast of the United States.

1st, Admitting what I have asserted to be true, that the stream is the cause of the alluvions bordering it's bed, from it's still water depositing the matters that floated in it, we find a very simple and natural reason for the presence of tropical productions in a fossil state in latitudes very far north. It is highly probable, that the beds of petrified shellfish, discovered in sinking pits on the Irish shores*, none resembling which are to be found nearer than the West Indies, owe their origin to this cause, or to some other of a similar nature. At least that it's action extends farther than the banks of Newfoundland is indisputable.

2dly, On considering the spread of the stream on the bank of Newfoundland as the mouth of this kind of marine river, we have also a plausi-

wise found, that on shoals his thermometer sunk 3° of Reaumur. Mr. Lalande, who has published this fact as a discovery, was no doubt unacquainted with those I have mentioned.

* See the Philosophical Transactions, Vol. X, p. 396, and Vol. XIX, p. 298.

ble reason for the multitude of cod fish there, and their predilection for it's waters; for the stream, as it coasts along the whole shore of the continent from Florida, becomes the vehicle of all the animal and vegetable substances brought down and conveyed to the sea by the numerous and extensive rivers of the United States; and these light substances, continuing to float on till the strength of the current is lost, it is very natural, that the cod, of which they are the food, should collect at the spot where they subside.

3dly, And lastly, I perceive here an explanation of the eternal fogs, for which these latitudes are noted, and the particular cause of which is unknown. In fact, as the stream is continually bringing thither an immense body of tropical water, the temperature of which is 9° of Fahrenheit hotter than that of the surrounding sea, two effects must be produced, one a more copious evaporation, occasioned by the warmth of this foreign water, the other a more extensive condensation, produced by the coldness of the native water, and it's atmosphere, which is precisely in the direction and under the influence of the winds from the north-east and the icy bay of Hudson.

But it is time to return to my subject, from which in fact however I have not wandered, since, speaking of currents in general, those of the

seas do not form a digression foreign to those of the air, which are their habitual impelling cause on the ocean*.

§ V. *Of the North-west Wind.*

The north-west wind, the third, and almost the principal, of those that prevail in the United States, differs from the south-west in two respects: it is essentially cold, dry, elastic, violent, and even tempestuous; it is more frequent in winter than

* While this sheet was in the press, I received from America the fifth volume of the Transactions of the Society of Philadelphia, and in it I found, p. 90, a paper by Mr. Strickland, who, from a series of observations made in 1794, on a voyage to Europe and back again, confirms all I have said respecting the indications of the thermometer. This writer adds, that he perceived a branch of the gulf stream in the latitude of Jaquet island [lat. 47, long. 39 W. from Greenwich]; and he insists on the probability of the conveyance of tropical productions to the Irish coast by the waters of this stream. His observations confirm me in the opinion, that the bank of Newfoundland is the bar at the mouth of this great marine river, which, before it had thrown it up proceeded straight onward north-east to Ireland, and did not turn off toward the east, till this bar, accumulating and enlarging from age to age, proved an obstacle to it's direct course. The gravel of this bank should be compared with that of the Atlantic Coast.

in summer, and more habitual on the Atlantic Coast than west of the Alleghany mountains, that is in the basins of the St. Lawrence, Ohio, and Missisippi. I know nothing to which I can better compare it than the *mistral* of Provence, which is likewise a north-west wind, though of a very different origin: for the mistral, unknown on the north of the Alps, and the mountains of Vivarais and Auvergne, goes not beyond our temperate ocean for it's source, which it evidently derives from the upper region of the mountains that surround the basins of the Rhone and the Durance, the principal theatres of it's rage; and it appears to me to proceed chiefly from the summits of the Alps, the air of which, cooled by the snow and glaciers, rushes down into the valleys sloping toward the south, and particularly into that of the Rhone, where it's course being diverted and reverberated by the chains of the Vivarais, it takes a north-west direction throughout all Provence. Into the se valleys it rushes with the more violence, as, beside it's specific gravity, and the pressure of the lofty atmosphere whence it proceeds, it finds on the Mediterranean an habitual void, occasioned by the suction of the coasts and burning continent of Africa. Accordingly it is always first felt at sea, and thence progressively in the interiour parts of the country. Perhaps currents

from the summits of the chains of Vivarais and Auvergne mingle with the torrent of air, that descends from the Alps: but they are only accessaries, the grand focus or reservoir being evidently the lofty Alpine heights, without which it would be impossible to conceive or explain the appearances of the mistral, sudden as the report of a cannon after every rain, particularly in the hot season.

The American north-west wind has indeed something of this suddenness; and I shall have occasion to show, that in many instances it likewise proceeds from the upper regions of the atmosphere: but commonly, and when it continues long, it comes as far as from the frozen seas of the pole, and the equally frozen deserts north-west of Lake Superiour. It was formerly supposed, that this lake and the four contiguous to it were the chief and even primary cause of the cold brought by the north-west wind to the Atlantic Coast. Now, when the whole continent is better known, this opinion is retained only by the vulgar: accurate observers had already remarked, that in the countries of Vermont and New York the cold was as intense as in those that lie to leeward of the lakes; and the accounts of the Canadians in the fur trade, who travel far beyond the lakes, have removed all doubt of this. These traders

unanimously affirm, that the farther they advance in the Great North *(Grand-nord)**, the more violent and icy is the north-west wind; and that it is their chief torment in the treeless and marshy plains of that Siberia, and even in ascending the Missouri as far as the Chippewan Mountains. It must be admitted, therefore, that the american north-west wind derives it's primary source both from these deserts, which from the latitude of 48° and 50° are frozen nine or ten months of the year, from the Frozen Ocean, which begins about the latitude of 72°, and from the north part of the Stony or Chippewan mountains, which appears to be covered with snow throughout the year. It is to be observed, that beyond these mountains, on Vancouver's Coast, the north-west wind coming from the ocean and Behring's Bay is more moist and less cold, and as it blows with much less constancy it belongs to another system †.

* The Canadian term for the whole country.

† According to captain Meares the north is the prevailing wind in these latitudes.

To give an idea of the coldness produced in the air by icy surfaces, I need only mention an observation of Charlevoix. This missionary relates, that crossing the bank of Newfoundland, during mild weather, the vessel was suddenly assailed by such a freezing wind, that all the passengers were obliged to take shelter between decks. Presently

On the Atlantic coast, the north-west wind, having traversed the continent, sometimes too brings with it storms of rain or snow, or even of hail; but these clouds belong rather to other currents of air, as the north-east and south-west, which it beats back, and robs as it drives them before it. At other times they are the product of the humid surfaces it finds on it's way; as the five great lakes, that communicate with the river St. Lawrence, the marshes, and even the rivers taken in the length of their course. This is the reason why under the lee of these lakes, and of the long lines of the Missisippi and Ohio, the north-west wind is characterised as wet in winter, and stormy in summer, which it is not in other places: For from Charlestown to Halifax the idea annexed to the north-west is that of a violent, cold, unpleasant wind, but healthy, elastic, and reinvigorating the languid powers. It has this degree of treachery only in winter, that, while a clear sky and bright Sun delight the eye and invite you to enjoy the

they discerned one of those islands of ice, which every spring come floating from the north into the Atlantic, and as long as they remained under the lee of this island, which was near a mile in length, the coldness of the air was insupportable. They who sail to Newfoundland experience similar occurrences almost every year.

open air, if you venture out of doors you are assailed by a cutting wind, that makes the face sore and draws tears from the eyes, and the broad impetuous gusts of which render your steps insecure over the icy surface of the ground. Less rude in summer, it is longed for to moderate the violence of the heat; and indeed it pretty frequently shows itself at that season after a heavy storm of rain and thunder. But as it is impossible, that the lapse of half an hour is sufficient for it to have come from any distance, it is evident on such occasions it must descend from the superiour region of the atmosphere, which in these latitudes is not more than 3000 or 3200 yards distant: the vacuum being formed near the ground by the condensation of the clouds into rain, the upper stratum sinks down to fill it; and the direction it acquires is from north-west to south-east, because the atmosphere toward the ocean, as far as the tropic, consists of a light warm air, incapable of maintaining an equilibrium against this cold and heavy current; while the reflux of the south-west and of the trade wind of the tropics, the countercurrent of which comes to fill these middle latitudes, prevents it from taking it's course due south. All these currents appear to unite together, to form on the Atlantic Ocean, from the

latitude of 35° to 48° and 50°, that westerly wind, which we find almost perpetually prevailing on the coasts of England, France, and Spain.

This attraction or suction of the Atlantic atmosphere is confirmed by the following observation of Mr. Williams. 'It is remarked, that our north-west and west winds always begin on the sea side: that is, if several ships be in a line, that farthest out at sea feels the wind first, and so in succession to that nearest the shore, which it reaches last.'—*History of Vermont*, p. 48.

Sailors daily make the same observation on the breezes along the shore, that of the day, called the sea breeze, beginning always inland, on the summits of the mountains and hills, which about noon become the focus of heat, I had almost said the chimney of the draught; so that the wind is felt there a quarter or half an hour before it is on the shore, in proportion to the distance between the two places, as I have frequently remarked in Syria and Corsica: and the land breeze beginning also on the same summits, because there refrigeration first takes place, and the air by it's weight flows down the mountains toward the sea like a current of water. This difference in the mode of acting of certain winds or currents of air deserves to be studied, as it serves to characterise the nature of the air that composes them; but in all cases it is no less the ef-

fect of comparative voids and alternations of density occasioned by the presence or absence of the Sun, now on the sea and anon on the land; the effect of which is a kind of systole and diastole experienced by the air alternately heated, dilated, and ascending, and cooled, condensed, and descending *.

* These descents of the cold air of the middle or upper region are attested by Belknap, who mentions a place in New Hampshire where the wind seems always to fall from above like the water of a mill; and I might mention a remarkable instance in France, on the mountains of Forez, which separate the basin of the Rhone from that of the Loire. In several parts of this chain, but particularly at Farge, a country seat between Belleville and Rouane, sixteen or seventeen miles beyond Tarare, it is constantly found, that on ascending the steep acclivity of this chain on the side of the Rhone you feel no wind, but just as you reach the summit of the ridge, and still more as you begin to descend it toward the Loire, you perceive an extremely brisk wind, blowing from the east to the west, or from the basin of the Rhone to that of the Loire: and if you then return, and descend the east side of the mountains toward the Rhone, you no longer feel the wind. The reason of this is, the basin of the Rhone is a spacious lake of cold dense air, communicating with the atmosphere of the Alps; while the basin of the Loire is a lake of lighter and warmer air, brought from the ocean by the prevailing westerly winds: the chain of Forez is a mound separating these two lakes, and keeping both tranquil as high as it reaches; but above this mound the surplus air of the basin of the Rhone overflows like water, and

It remains for me to remove one objection against a fact, that cannot fail to have struck the reader. I have said, that the north-west wind is much more frequent on the east of the Alleghanies, than on the west: but it may be said, how is it possible, that it should reach the former country, without having passed over the latter, which lies in it's way? As the fact is averred, there must be some reason to be assigned for it, and it is analogous to that I have given in the preceding note: namely, that the Alleghanies are the mound of an aerial lake, the bottom of which, up to the level of this mound, is in a state of rest or fluctuation, under it's protection, independent of the surplus stratum above it; so that while the south-west wind traverses the basin of the Missisippi, and the territories of Kentucky, the Ohio, &c., as far as the basin of the St. Lawrence, by which it flows off, the north-west current glides over it diagonally, and passes over the Alleghanies on a level with their summit, to pour down on the Atlantic Coast, where it acquires three causes of acceleration, the gravity of the fluid itself, the slope of the ground, and the vacuum over the ocean toward the south-east.

shows itself the more cold and rapid, because it is the discharge of the middle region of the air coming from the Alps, and descending as it glides over the aerial lake.

The same case occurs with respect to the St. Lawrence and Lower Canada, where travellers agree in saying, that the most habitual wind is the south-west, and next to it the north-east. Very frequently the north-west is not felt at Quebec, while it blows in Maine and in Nova Scotia: it is evident, therefore, that it must have glided over the concave bed of the St. Lawrence, without displacing the air stationary in it; and if we consider, that through a room where two opposite windows are set open a very brisk wind passes, without extinguishing or even agitating a candle placed in the corners or at the sides, out of the current, we may conceive, that the air has something tenacious and oily in it's nature, which renders it more difficult to displace than is consistent with the ideas commonly entertained of it.

One curious fact respecting the north-west wind still remains to be mentioned, it is, that in the United States the mortar and plaister of walls exposed to it's direct action are always harder, and more difficult to demolish, than those with any other exposure, no doubt on account of it's extreme dryness. In the forests too the bark of the trees is thicker and harder on the side exposed to it than on any other; and this observation is one among others, by which the savages are guided in their travels through the woods, even in the fog-

giest weather. To facts and observations simple and natural like these are they indebted for that sagacity, which we admire in them; and when romancing travellers, or writers who have never quitted their own fireside, speak in raptures of the address of savages, and thence take occasion to ascribe to their *man of nature* an *absolute* superiority over civilized man, they only show us how ignorant they are of the huntsman's art, and the improvement of the senses of smelling and sight by the habit and practice of any exercise. At present, when there are in America innumerable instances of settlers on the frontiers, natives of Ireland, Scotland, and Kentucky, who in the course of a few years have become as able and adroit woodsmen, and more vigorous and indefatigable warriors, than the *red men**, credit is no longer given to the pretended excellence of the corporal and mental faculties of savages, or to the superiority of their way of life; and what I shall have occasion to say elsewhere on this subject more at large, and with impartiality, will assuredly tend much less to excite sentiments of envy or admiration, than of pity and horrour.

* The name by which the savages distinguish themselves.

CHAPTER X.

The Climate of the United States compared with that of Europe in respect to the Winds, the Quantity of Rain, Evaporation, and Electricity.

After all I have said of the winds, their beds, their course, and their qualities in common, as well as local to the United States, it becomes easier to form a clear and general idea of the climate of that extensive country. Since we know, that the predominant winds there come almost directly from the torrid zone or the frigid, we conceive why they have such striking contrasts of heat and cold, and why the climate is so variable and capricious: as we understand, that one of the prevailing winds, the south-west, blows from a warm sea, another, the north-east, from a very cold ocean, and the third, the north-west, from frozen deserts, we perceive the reason why these are clear and dry, wet, or foggy. We even divine the exceptions, that certain local circumstances can and must occasion to these general rules; and we naturally infer, that a dry wind may become rainy, if in it's course it meet with watery surfaces, as those of lakes, marshes, and the ex-

tended lines of rivers; as occurs in the country of Genessee, where it rains with a north-west wind, on account of the lakes Ontario and Huron, and with a south-west wind, in consequence of Lake Erie; while the north-east and east, so rainy on the coast, are there dry*. On the contrary, a rainy wind may become dry, by depositing on the mountains the humidity it brings: finally, in violent agitations of the atmosphere, as the currents mingle, their qualities may be temporarily changed and confounded together.

On the other hand, when we consider, that the territory of the United States is traversed only by mountains of an inferiour order, which do not oppose to the currents of air an obstacle sufficient to interrupt their course, we perceive why the winds there are and must be almost always general, that is, to use an English expression, must *sweep* the whole surface of the country both in length and breadth. In fact there is no striking exception to this general rule but the sea and land breezes, which take place during the six summer months, and which are governed by the direction of the coast

* In like manner, at the sources of the Wabash and of the two great Miamis it rains with every wind: at Gallipolis, on the Ohio, it rains particularly with a west and south-west wind, while lower down, at Cincinnati, the west wind is dry, and it rains with the north-west.

or the beds of rivers, and by the distance, slope, and aspect of the chains and ridges of mountains. For instance from Florida to New Jersey the breeze inclines to the south-east, and we see the land slopes and the coast turns to that quarter. On the contrary, from New York to Cape Cod the breeze is due south; and from Cape Cod to Nova Scotia it comes from the east and north-east, the same principle still applying to these different cases. In like manner too it is more languid or more brisk, stronger or weaker, earlier or later, according to the greater or less intensity of the heat, the greater or less slope of the land, and the distance or proximity of the heights, where the focus of suction is formed*, as the seaman well knows by experience.

From these facts arise two corollaries, that throw great light on physical geography.

One, that the temperature or climate of a country is determined by it's habitual currents of air, or it's *winds*.

The other, that the topography of the land has

* In Massachusetts the breeze commences as early as half after eight or nine o'clock in the morning in the month of june; while in Carolina it does not set in before ten or eleven. Compare the respective distances of the mountains from the coast, and you will immediately perceive the reason of this.

commonly a decisive influence on the direction of these currents, and thus becomes an effective cause of the climate, and a constituent part of it.

Our quarter of the globe affords an instance and application of these two principles the reverse of North America. In the west of Europe the grand rainy winds are the westerly, because they come from the Atlantic ocean; and they are colder in England, hotter in France and Spain, on account of the latitudes from which they proceed. In the United States the westerly winds are the driest, because they arrive there from the broadest part of the continent. In France they are the most general, the most habitual, because there the lofty chain of the Alps is a focus of suction and condensation, that incessantly attracts them toward it: in the United States they are the most rare, because in them there is no predominant point of suction. In Europe winds are scarcely ever general, but rather divided into independent systems, because the high chains of mountains, as the Alps and Pyrenees, form enclosures and as it were great lakes of air, separate and distinct from each other; and because too a number of secondary chains, such as the Asturias and the other ridges in Spain*,

* The chain that parts St. Ildefonso from the Escurial separates the atmosphere of these two places in such a manner,

the Cevennes, Vosges, Ardennes, Appennines, Carpathian mountains, Dofrine hills in Norway, and the mountains of Scotland, almost all higher than the Alleghanies, form subdivisions equally marked.

In France alone we have as many systems of winds as basins of principal rivers, such as the Rhone, the Garonne, the Loire, and the Seine. Flanders has it's system distinct from ours in consequence of the Ardennes: it derives from the English channel a current of air, which, primarily west, then deviating to south-west, causes there that humidity, which renders the land so fertile and well adapted to pasturage.

On the other hand, if the west of Europe be more temperate than the east, it may be, as Pallas has observed, because it is sheltered by the mountains of Scotland and Norway; but it is still more because the most general and predominant winds are the west and south-west, and that they come to it from the sea, which is always more temperate than the land.

This is the reason why the coast of Norway is totally different from that of Sweden, and why the climate of Berghen no more resembles that of

that, though they are within sixteen or eighteen miles of each other, they are in two different climates.

Stockholm, than the climate of London does that of Petersburg. It is to the east and north-east winds, coming from Siberia, that the east of Europe owes it's cold, dry, and salubrious climate; and if Russia had been protected by mountains on it's eastern frontier, if Siberia had been sheltered by natural ramparts toward the polar sea, this country, as well as Poland and the neighbourhood of Moscow, would not have been colder than Denmark and Saxony.

This difference between the topography of Europe and North America appears to me to be the chief, if not the sole cause of several meteorological differences, observed in the atmospheres of these two continents. We find in it a satisfactory explanation of two or three singular phenomena and problems, as for instance, why the annual and mean quantity of rain is greater in the United States than in France, England, or Germany: why the fall of this rain is generally more sudden in America than in Europe, and it's subsequent evaporation more speedy: lastly, why the winds are habitually more violent, and tempests and hurricanes more frequent in America. Some particulars are necessary, to render these facts more precise, and their solution more probable and convincing.

§ I. *Of the Quantity of Rain that falls in the United States.*

Numerous and accurate observations, made by various intelligent Americans on different parts of the Atlantic coast, have ascertained, that the annual and mean quantity of rain falling in the United States is much greater than in most countries of Europe, excepting certain mountainous regions*, or heads of gulfs. The following table affords a proof of this. No place in the western country is included in it, because observations of this kind have not been made there, at least that I know of.

	inches Eng.
At Charlestown, according to Ramsay, in 1795 - -	$71\frac{4}{5}$
At a medium from 1750 to 1759†	$41\frac{3}{4}$
At Williamsburg‡ - -	47
At Cambridge, near Boston§ -	$47\frac{1}{2}$
At Andover, in Massachusetts -	51

* For instance, Udina, where the annual quantity is 66 inches, and Garsagnana, where it is 98. In the West Indies it exceeds 106 inches.

† According to Chalmers, quoted by Ramsay.

‡ Jefferson, p. 123.

§ S. Williams, History of Vermont, p. 51.

At Salem * - - -	35
At Rutland, in Vermont * -	41
At Philadelphia † - -	30

In Europe, on the contrary, the quantities are only as follows.

At Petersburg - -	$12\frac{4}{5}$
At Upsal - - -	15
At Abo - -	$25\frac{2}{5}$
At London - -	$22\frac{2}{5}$
At Paris - - -	$21\frac{2}{5}$
At Utrecht - -	$28\frac{4}{5}$
At Brest, no observation ‡	
At Marseilles - - -	$21\frac{2}{5}$
At Rome - -	$30\frac{2}{5}$
At Naples - -	$37\frac{2}{5}$
At Algiers - -	$29\frac{1}{5}$
At Padua - -	$35\frac{1}{5}$
At Bologna - -	$25\frac{3}{5}$
At Vienna - -	$44\frac{4}{5}$

Hence it follows, that in Europe, at a medium, one third less rain falls than in North America: yet in his memoir already quoted Mr. Holyoke men-

* S. Williams, History of Vermont, p. 51.

† Dr. Rush, Observations on Pennsylvania, American Museum, Vol. VII.

‡ To make up for this deficiency I have seen a meteorological journal in manuscript, where the number of rainy days at Brest is 349 in the year, while at Marseilles the number of fair days is 352.

tions twenty cities in Europe, which, at a mean of twenty years have had 122 days of rain, while

Cambridge has had but - 88

And Salem - - 95

Thus a greater quantity of rain in fewer days evidently indicates, that in America it falls in heavier storms, in Europe in gentler showers; and we have seen, that facts accord with this reasoning.

§ II. *Of Evaporation and the Dryness of the Air.*

On the other hand, observations equally accurate and numerous testify, that the evaporation of these rains proceeds much more quickly in the United States than in Europe, and that consequently the air there is habitually drier and less calm. Franklin had already made and published this observation, so contrary to the assertions of Pauw*, mentioning the circumstance of a maho-

* Pauw's Inquiries concerning the Americans is a strange book. When I returned from America, I was desirous of reading it, to profit by the great fund of information, which it was reputed to contain: but when I saw with what confidence he adopts false facts, with what boldness he deduces from them chimerical consequences, and advances and maintains incongruous paradoxes, and with what acrimony he attacks other writers, the book dropped from my hands. I

gany box with drawers, executed with the greatest care by the celebrated Nairne. The drawers of this box, which fitted exactly, and even tight at London, were found to be too loose at Philadelphia; and when it was sent back to London, they again became as close and tight as before. Hence Franklin justly inferred, that the air at Philadelphia was drier than at London: but the case of these two cities was not sufficient, to found a general rule. Mr. J. Williams has farther illustrated and established it by the following facts*. He has found by a series of experiments and researches, that the mean quantity of evaporation, at Cam-

cannot conceive how a man can sit down in his closet, and decide peremptorily on facts he never saw, from incompetent or contradictory witnesses: for my own part, the more I have seen of the World and extended my observations, the more am I convinced, that nothing is less frequent, or requires greater nicety, than to observe objects, particularly complex ones, in their proper point of view, and in their true connexions: that it is almost impossible, to speak reasonably of the general system of a country or of a nation, without having resided in it: that it is the same, and even worse, with regard to times past: and that the greatest obstacle to the advancement of knowledge is that spirit of certainty, which has hitherto formed the basis of education among almost all people.

* Transactions of the American Philosophical Society.

bridge, near Boston, for a term of seven years was - - - - 56 inches
while in seven German and Italian cities, on a mean of twenty years, it was only 49
which makes a difference of - 7
yet the cities of Italy are in a latitude much more favourable to evaporation than the vicinity of Boston, adjacent to the Atlantic ocean.

	Fair days.
In one year there were at Salem	173
At twenty cities in Europe	64
	Cloudy days.
At these same twenty cities there were in 1785 - - - -	113
At Cambridge, near Boston - -	69
At Salem, taking a medium of 7 years	90*

	inches
* It was observed, that water in vessels renewed once a month, evaporated - -	4·10
Renewed once a week - -	6·35

No doubt because in the former case the wind did not reach the bottom of the vessel.

2dly, On a river, a vessel evaporated -	1·15
In a dry place it lost - -	1·50

3dly, Four plants, weighing 118 grains, placed in a box of pure sand, and well watered, evaporated 10944 grains, which are more than would have been afforded by a surface of ten square inches in the same space of time.

Thus, generally speaking, more rain falls in the United States in fewer days than in Europe; and there are fewer cloudy days, more fair days, and more evaporation. Now the cause of these different facts appears to me perfectly simple and unequivocal: it exists in the peculiar state of the atmosphere in each of the two continents, as it is modified by their respective topographical circumstances.

Thus, if in the United States it rain more than in Europe, it is because all the winds there, except the north-west, and particularly those that are most prevalent, come from some sea, and consequently arrive loaded with moisture.

If the rain there be more heavy and sudden, it is because the winds differ widely in the degrees of heat and cold, which in the first instance is a cause of solution; and the mixture of these hot and cold currents is very frequent, which in the next place occasions heavy and copious rains. Our fine gentle showers are so rare in the United States, that the Americans call them *English rains*, or *English weather:* and when they do occur, which sometimes happens after the equinox, it is the fashion for people to go out without umbrellas, and get themselves wet to the skin. Now this frequent mixture, which renders the air so variable, happens because the country is nearly flat, and the

winds find no obstacle to stop them: thus it's topography has a fundamental influence on the abundance and heaviness of the rain.

In Europe, on the contrary, lofty mountains break the currents of air; the atmosphere is more calm, more stationary; the mixtures of cold and hot winds are less easy, and less frequent; consequently dissolution takes place with less rapidity, the rains are more slow and gentle, the air remains more loaded with vapours and humidity, there are more fogs and cloudy days, &c., and evaporation is more tardy.

If evaporation be more rapid in the United States, it is because the winds are free, in consequence of the general plainness of surface, and because one of these, the north-west, which is extremely dry, prevails for two fifths of the year.

In Europe, on the contrary, the grand prevailing wind is the west, which is also the most wet.

Finally, it is this powerful evaporation in the United States likewise, that causes those immense dews, unknown in our temperate climates. These are so copious in summer, that the first nights of my sleeping in the desert forests of the Ohio and Wabash, I thought, when I awoke, it was raining heavily: yet on looking at the sky it was clear and serene; and I presently perceived, that the

large drops, falling with such a noise from leaf to leaf, were nothing but the morning dew, that is to say, the evaporation of the preceding day precipitated by the coolness of the dawn. Lastly, if the winds there be more rapid, and hurricanes more frequent than in Europe, it is not only because the tropic is less remote, but because the currents of air find no bar to check and fix them; and if the Apalachian chain were sixteen or eighteen hundred yards high, the atmospheric system of all the western basin would be different.

§ III. *Of the Electricity of the Air.*

The last meteorological circumstance, in which the air of the American continent differs from that of Europe, is the quantity of electric fluid, with which the former is much more highly charged. There is no occasion for any philosophical apparatus, to render this fact evident to the senses: it is sufficient to draw a silk riband briskly over a piece of woollen cloth, to see it contract with a promptitude I never observed in France. Storms too afford terrifying proofs of it in the loudness of the claps of thunder, and the prodigious vividness of the flashes of lightning. When

I first saw thunderstorms at Philadelphia, I remarked, that the electric fluid was so copious, as to make all the air appear on fire by the continued succession of the flashes; their arrowy and zigzag lines were of a breadth and length of which I had no idea; and the pulsations of the electric fluid were so strong, that they seemed to my ear and to my face to be the light wind produced by the flight of some nocturnal bird. These effects are not confined to the eye and ear; for they frequently occasion melancholy accidents. In the summer of 1797, from the month of june to the 28th of august, I counted in the newspapers seventeen persons killed by lightning: and the late Mr. Bache, Dr. Franklin's grandson, editor of the paper entitled the Aurora, to whom I communicated my remark, told me, that he had reckoned eighty severe accidents. They are frequent in the country, particularly underneath trees; and the people are not sufficiently acquainted with the efficacy of oiled or varnished silk or cloth, which are the best preservatives on such occasions, while at the same time they are a defence against the rain.

This abundance of the electric fluid is an additional proof of the dryness of the air, as it's inferiour quantity in France and in Europe is a proof of humidity. It appears certain, that calo-

ric is absorbed and neutralized by water in a state of vapour, and that then it no longer displays it's natural properties: on the contrary, when the air is very dry, even if it be cold, the igneous matter, finding nothing to combine with, is superabundant, and manifests it's presence, wherever the laws to which it is obedient permit. This must be one of the reasons, why vegetation, when once it takes place, is much more active in the United States than in France: and it cannot be said, that the heat of the season or of the tropics is a necessary cause of the abundance of the electric or igneous fluid, for it is never more copious than with the cold north-west wind; and according to the observations of the learned in Russia, as Gmelin, Pallas, Muller, Georgi, &c., electricity is excessively abundant in the dry and frosty air of Siberia *. Thus the level surface of America, promoting the rapidity of the aerial currents, the speedy evaporation of water, and the dryness of the atmosphere, becomes a primary cause of the abundance of electricity.

I shall add one remark, which may be of importance in physiology. It is known, that fogs and dampness are constant and prolific causes of dis-

* They remark at the same time, that the inhabitants, particularly the women, are of excessively irritable habits.

ease; that they particularly occasion colds, catarrhs, rheumatisms, in other words, obstruction and atony of the whole vascular system; and that they produce fevers of various kinds, but all with the common symptom of shivering, succeeded by great heat. Now if the effect of moisture, either in mist or in vapour, be to attract and appropriate to itself the electric or igneous fluid, taking it from those bodies in which it exists; if this electric or igneous fluid in our organs be one of the principles of life, one of the causes of the circulation of the blood and other fluids; in particular if it be one of the constituent principles, perhaps even the radical principle, of the nervous fluid; may we not conclude, that water in mist or in vapour is so injurious to us by abstracting from our bodies this vital principle; and that by absorbing this from our cellular membrane and nerves it renders them paralytic, and reduces them to a state of atony, and temporary or permanent obstruction, according to the force and continuance of it's action? And in this case, beside the preventive indication, would not the remedial be, to find means of restoring this fire by an inverse process of the same kind? The effect of fomentations, and frictions with warm substances, as even with a tailor's goose, confirms this opinion; but a more radical opera-

tion, and more conformable to the principles of chemistry, remains to be discovered, and calls for the talents and experience of professional men *.

CHAPTER XI.

Conclusion. Has the Moon any Influence on the Winds? The Action of the Sun on the entire System of the Winds, and on the Course of the Seasons; Changes produced in the Climate by clearing the Ground.

Hitherto I have made no mention of the influence over the atmosphere and course of the winds, which some natural philosophers ascribe to the Moon. This opinion, formerly so current,

* In several hot countries, among others in the island of Cuba, when it rains, the peasants working in the open air take off their clothes, place them under shelter, and do not put them on again till their bodies are dry. When they do this, they never get a fever; but, on the contrary, if they suffer their clothes to get wet, and dry upon them, they never fail to be seized with one.

but which among the ancients belonged rather to astrology than to astronomy and physics, has been revived of late years with means more capable of gaining it partizans. Reasoning from the analogy of the tides, it has been said, that, since the Moon is the cause of the ebbing and flowing of the ocean, since it exerts a pressure on the liquid surface of the Globe so as to repel it; this pressure cannot take place without the intervention of the atmosphere, which consequently must also have it's flux and reflux, and hence a complete theory of the winds. But as the whole of this theory, however plausible, must be a mere romance unless established by facts, it was requisite to adduce facts in it's support; and this task has been undertaken by Mr. Lamarck, one of our ablest naturalists. What will be the issue of his inquiries I pretend not to say; but I shall observe, that the method adopted by him claims our esteem: by publishing a meteorological diary, and predicting a year beforehand the winds and temperature, which the northern or southern aspects of the Moon should produce, Mr. Lamarck has subjected his system to the most legitimate and delicate test: every month, every quarter of the Moon, any person may compare the prognostic with the event; and this comparison is even a necessary supplement to the labours of

Mr. Lamarck, from whom we have a right to expect, that the history of the year past will be inserted in the calendar of that to come. Whatever be the issue of his labours, he will have the merit of demonstrating a truth: for, should it come out contrary to his opinion, that the general system, or certain particular systems of the wind, are independent of the Moon, this negative truth will be a valuable result, and produce all the utility consistent with the subject. How great a number of errours would be removed, if we acquired many negative truths, in the various branches of knowledge, or rather of our opinions, the reader himself is sufficiently aware.

In the present case my own opinion was founded on too many previous facts, to remain undecided: but had it been to be formed from the results of the experiment I have mentioned, it would be impossible for me to perceive any immediate or sensible action of the Moon on the general system of the winds. I do not pretend to deny, that this satellite is the cause of the ebbing and flowing of the ocean; but admitting any hypothesis of it's pressure as proved, still this demonstrates nothing with respect to the winds; for the aerial ocean may experience a pressure affecting it as a body, without it's internal movements being deranged or modified by it, in the same manner as

the sea experiences a movement of libration, without it's interiour currents being changed or disturbed. The effect of the tides is noticeable or plainly observed only on the shores, that is by the interruption of the homogeneal fluid, and it's shock against extraneous masses and levels: but the aerial ocean, spherical as the Globe itself, has nothing like this; it's undulation, if it have any, rolls over it's surface, and the vast atmospheric wave, meeting neither shore nor shoal, flows smoothly on without any breakers. If the winds, those currents of air, so variable, so different, depended on the Moon, they must be correlative to it's phases, like the tides; they must have a periodical course, subject to the regularity or anomalies of that satellite, nothing like which is seen. Of the changes of weather prognosticated every year in the almanacs, and expected by the common people every quarter of the Moon, fifteen out of twenty are wrong; and it would not be surprising, considering the small number of changes, if they succeeded more frequently, without producing any thing conclusive. Even on the sea, where it is pretended the rules are more certain, impartial mariners agree, that the changes of weather have nothing certain, nothing regular in them; but that their causes must be referred rather to the approach of land, the vicinity of capes, and

the entrance on certain latitudes, or departure from them. Lastly astronomers acknowledge, that even the period of nineteen years, which brings back the same positions of the Moon, does not bring with it the least resemblance in the course or succession of winds; so that nothing establishes or proves an immediate and sensible action of the Moon on the currents of air.

It is different with respect to the action of the Sun, which displays itself both in their first formation, and in their general or partial movements; as well as even in their irregularities, which are always occasioned by the different and variable degrees of heat, that it's presence or absence excites on the land and sea; and by the topographical circumstances of mountains more or less elevated, and a land more or less naked or woody, that obstruct or permit the course of the winds. It is the Sun, that, placed in the equator, establishes there in the first instance the grand current of the trade-wind, which influences all the rest, and which, like the course of that luminary, is directed from east to west, not by the mechanical effect of the rotation of the Globe leaving behind it's aerial envelope, but because the Sun produces immediately beneath it a focus of heat, which, like itself, is continually progressing from east to west, and immediately replaced by the column of cold air left be-

hind, attracted and flowing after it. Hence that peculiarity of the trade-wind, always to blow strongest at noon, or at the moment of the greatest heat, and weakest at midnight. When the Sun passes to the southern tropic, the zone of the trade-wind moves with it, and leaves the north of the equinoctial line by an equal number of degrees. When the Sun returns to the northern tropic, the trade-wind returns with it, and narrows it's southern bed in a similar proportion. On the Pacific Ocean this current follows more regular laws than elsewhere, because the action of the Sun is more uniform, more equal, on the vast surface of that sea: but as the land is susceptible of a greater degree of heat than the sea, this action changes as it approaches the continents, and with it the current of air is modified near the coasts of India, Africa, and South America, conformably to their position and configuration, and the manner in which the Sun acts upon them. Thus, as in summer it's rays act vertically on all the basin of the Ganges, a focus of heat and suction is established on the east of the chain of the Ghauts, that separate Malabar from Coromandel, which occasions the current called the summer monsoon. This current is south-west, rainy, tempestuous, and hot in the country of Malabar, because there it comes from the sea between Arabia and Africa:

while in Coromandel it is north-west, dry, and cold, because it has passed over the lofty region of the Ghauts, where it is divested of it's heat and rain*.

In winter on the contrary, when the air of India is cooled by the retiring of the Sun, another monsoon takes place, the direction of which is north-east, because then the snowy mountains of Thibet pour their stratum of cold air over the flat country and the Bay of Bengal; the light and damp air of which is to it relatively an unresisting vacuum.

In the mean time on the Atlantic, between Africa and the coast of Brasil, a similar mechanism produces different effects, because the geographical circumstances differ. The African continent has no lofty mountains under the equator, that imperiously call a great current of air upon it's surface;

* Several natural philosophers and geographers imagine, that the north-west wind in Bengal comes from the mountains directly north-west of the country: but, beside that these are too remote, the effects on both sides of the Ghauts so correspond, that we cannot admit it to have any other source: it is the inclination of the eastern slope, which the course of the river shows to be north-west and south-east, that determines the alteration of the wind; as it is likewise in consequence of this inclination, that the Sun, heating this slope before it heats the back of the Ghauts, occasions there anteriourly a movement, by which the air of the Ghauts is first attracted, and afterward that of Malabar.

it's shores attract only from the distance of eighty or a hundred leagues the air necessary to the focus of which they are the seat, and the trade-wind does not begin it's course till beyond the sphere of this littoral attraction.

America, on the contrary, experiences and occasions various different incidents;

1st, by the singular configuration of it's two continents, which form as it were two large islands;

2dly, by the great void, or cul-de-sac, which these two continental islands leave between them;

3dly, by the mountainous isthmus of Darien, that forms the bottom of this cul-de-sac, and connects the two parts of America;

4thly, and lastly, by the chain of it's mountains, the highest upon the Earth; which, running along the border of the Pacific Ocean through Chili, Peru, the Isthmus of Darien, Mexico, &c., leave on the east an immense flat country, while on the west they have no shore but an acclivity as high as it is steep.

From this topographical conformation it follows with respect to South America, that the Sun, darting vertically on this continent in it's broadest part for six months of the year*, establishes over all the country east of the Andes, namely Brasil, Ama-

* From the autumnal equinox to the vernal, which period is the summer season in the southern hemisphere.

zonia, &c., a focus of suction, which on that side redoubles the activity of the trade-wind coming from the ocean. This focus even extends it's action beyond the equator to the north, and occasions the trade-wind there to deviate into a north-easterly direction, and carry to Guiana all the humidity of the Atlantic. The chain of the Andes is the common point, where all these winds terminate; and as it's extreme elevation totally stops their passage to the Pacific Ocean, they accumulate their clouds on it's eastern side. Accordingly the provinces of Cuya, Tucuman, and Arequipa are then renowned for being the seat of rain, thunder, and excessive heat; while the western side of the Andes, the country of Chili, enjoys a clear sky and temperate weather, under the influence of the winds that we call south-west, but which are the true north-west of the countries lying on the other side of the equator*. These winds, which also climb the Andes, contribute to obstruct the passage of those from the east: accordingly the late historian of Chili† observes, the easterly winds so

* They come from that quarter that lies between the west and the pole. The dryness and coldness of these winds on the coast of Chili, added to their frequency, are indications of the nonexistence of any extensive land toward the south pole, and of the quantity of ice accumulated there.

† Molina, an Italian, author of a geographical, natural,

seldom reach that country, that there is no hurricane from that quarter of the compass on record, except in 1633. Consequently the two opposite currents of air, clashing against each other, rise together into the higher regions, where they are condensed, and no doubt bent into other currents, which slide off or descend again into the middle and lower regions:

On the other hand, when the Sun repasses the equator, and advances to the north of it as far as the zenith of the Havannah and the centre of the Gulf of Mexico, it's proximity produces a focus of heat and suction on the northern continent of America, which turns and attracts to that side the trade-wind, and this the more forcibly, because the focus in South America is extinguished or enfeebled by the withdrawing of that luminary. Hence after the solstice the easterly winds gain footing as far as 30° or 32° north, in the parallels of Georgia, and almost of South Carolina: and hence, after their predominant current, that afflux of the winds of the temperate zone, tending toward the frigid with the circumstances mentioned above. Thus the Sun incessantly shows itself the chief if not the only regulator of the whole system of the

and civil History of Chili, translated into Spanish by Mendoza, and elegantly printed at Madrid in 8vo, in 1788.

winds, either in their creation or in their movements; and it's power is manifested or indicated even in the true and apparent irregularity of their annual rotation, and in the singular course of the seasons in the United States, a course entirely derived from that of the winds.

In fact it is a remarkable circumstance, that in a country, where the cold is so severe, the winter should notwishstanding be more tardy, and set in later, than in Europe. With us, in the latitude of 45°, nay even in 42°, the middle of october scarcely arrives, before we have fogs, rain, or frost, almost every day, to the exclusion of fine weather for four or five months. In America, on the contrary, the winter season does not really commence, and bad weather become permanent, even in the northern states, till the middle of december, or a little before the solstice; and there are always three or four attempts, three or four grand crises in the atmosphere, before the northerly winds accomplish a general change of temperature, by driving back the winds of the south, which protect and maintain it.

The first of these crises regularly happens about the autumnal equinox, in the course of the ten days preceding or following the Sun's passing the equator. At this period there is always a general gale of wind, from some point between north-west and

north-east; and this, as I have already advanced, because the northern atmosphere rushes into the space, which the Sun quits and ceases to dilate. This gale we may call the first wave of the grand half-yearly tide of the aerial ocean; and it is accompanied with rain, brought by the waves of that ocean, which in their eddies and undulations have swept the surface of the sea. These rains produce by their evaporation the first coolness, that begins to temper the heat of summer, and that occasions the first frosts of the season, setting off from the line of the Patapsco on the Atlantic coast and of the Ohio in the western country. These frosts are not perceived in the flat country to the south, beyond the lines of the Potowmack and Ohio: in the north and in the mountains they accelerate the ripening of the Indian corn, by divesting it's ears of the thick husk*, which are thus exposed to the whole power of the Sun. The equilibrium of the air is soon restored, the west and south-west winds resume their course, and sometimes the heat becomes again as powerful as in summer, to which must be ascribed the periodical appearance and occasional violence of autumnal fevers.

A second crisis occurs about the 15th or 20th of

* 'En dépouillant de leurs graines épaisses ses épis.' Original.

october, that is, when the Sun has advanced 20° or 25° to the south of the equator. At this period another gale arises from the same quarter; as if the Sun, by some particular position, occasioned a fresh disturbance of the equilibrium of the atmosphere; and as if, becoming vertical to the great eastern cape of South America, included between St. Roque and St. Augustin, it suddenly determined the current of the trade-wind to double this cape, and spread along the coast of Brasil, the slope of which favours a brisker diffusion. With this gale come on fresh rains, fresh evaporation, farther cooling, and a new period of frosts, which now extend as far as Georgia and Carolina; and winter announces itself over the whole continent. These frosts wither the leaves of the forests, and from this moment their verdure assumes tints of violet, dull red, pale yellow, and mortdoré brown, that in the decline of autumn imparts to American landscapes a charm and splendour unknown to those of Europe. The north-east and north-west winds become more frequent: the south-west loses it's power, and declines toward the west: the air becomes colder, but the sky continues clear: the Sun is always hot in the middle of the day; and towards november a succession of fine days appears, which are styled the *Indian summer*. This is what is called in France a St.

Martin's summer*; but it is here grown so rare, and so short, that it is now spoken of only traditionally.

A third crisis, of greater length and obstinacy, comes on about the end of november. The rains and frosts increase, the leaves fall, the nights become longer, the earth colder; the north-west winds *get a footing*, as the sailors say; but fogs do not take place, as with us; there is no *hanging month*, as in England; the sky is clear, particularly in the north; november and part of december pass away in alternations of frosts and thaws. About the middle of december frost and snow come on in Vermont, Maine, and New Hampshire; and spread gradually like a veil as far as the high lands of New York. January frequently brings on a thaw; but it is succeeded by cold more intense. In february occur the greatest snows, and the most piercing cold. The progress of all these phenomena is the same, except with respect to intensity, in Pennsylvania, Maryland, and Virginia. Ramsay observes, that even in Carolina february is the killer of orange-trees; and this, because after a few moist warm days, with southerly and south-east winds, the north-west suddenly returns with more violence.

* In England, an All-hallown summer. T.

March, or the time of the approach of the vernal equinox, is cold and tempestuous, with gusts or showers of snow, brought by the north-east or north-west winds. It might be supposed, that the return of the Sun to this side of the equator must speedily bring back hot weather: but the predominance of north-east winds at this period, the continuance of the north-west, grown more tempestuous, and the coldness imparted to the earth by the snows and hard frosts, retard vegetation to such a degree, that april passes away, and leaves the ground as bare as march.

It is not till the beginning of may, even in Virginia in the latitude of 36° and 37°, that the trees of the forest reclothe themselves with leaves; which is the more astonishing, because the rays of the meridian Sun are insufferably scorching from the middle of april, and the difference of seasons between this country and Canada is not more than ten days, for the leaves appear, even at Quebec, before the 15th of may, only 25 days after the breaking up of the frost*; so that the change of seasons is as if a carpet of verdure or of hoar-frost

* At Paris I have observed for a number of years, that the first leaves of the horse-chesnut appear between the 24th of march and the 5th of april in the Tuilleries, and that those of the oaks in the forests unfold themselves nearly a month later.

were spread out or rolled up on a stage 800 miles in extent. Whence it follows, that, agreeably to a remark long ago made by Europeans, there is no spring in the United States; and that there is a sudden transition from severe cold to violent heat, with the incongruous circumstances of a freezing wind and a scorching Sun, a winter landscape and a summer sky.

When vegetation at length bursts forth, it's progress is extremely rapid: flowers are quickly succeeded by fruit*, and this ripens more speedily than with us. When the Sun, rising highest above the horizon, heats the whole continent, the northerly winds are repressed by those from the south and south-west: june brings on the most intense heats; july, the heats of longest continuance, with the most frequent storms; august and september, heats the most oppressive, on account of the calms with which they are accompanied; and if in either of these months there be three weeks following of dry weather, the heat is so powerful, as we are assured by Belknap, Rush, and other writers, that fires take place spontaneously in the woods and

* In 1798 I tasted the first cherries at Philadelphia and Newcastle before the 6th of june, and I ate the last at Bordeaux on the 6th of july. It is the universal opinion of Frenchmen, that the American cherries have a sharp acid, which ours have not, and which habitually manifests itself

marshes*. As this spontaneous ignition is inconceivable to me, I can neither admit nor reject it: in the mean while, till it is proved to me by reasoning or by facts, I must attribute the occurrence to lightning, or to the negligence of travellers, not extinguishing or imperfectly extinguishing the fires, which they kindle every night at the place where they sleep in the woods.

At length the autumnal equinox again arrives, and the series of phenomena I have described recommences, always varying with regard to particular circumstances, but sufficiently uniform in the general system; which consists in bringing back in winter the north-east and north-west winds, that are the chief cause of the coldness of the air; in reproducing in summer the south and south-west winds, that are the fundamental cause of heats, calms, and storms; and in the transition from heat to cold by westerly winds in autumn, which is the evening and *west* of the year, and by easterly

by colics: this I can confirm; and the same may be said of the strawberries.

* Some substances, such as powdered charcoal with iron filings and sulphur, linseed oil with lampblack, and others of a similar kind, are susceptible of spontaneous inflammation in certain degrees of heat and moisture: if such mixtures occur in marshes, it is certainly possible for fires to take place.

winds in spring, which is it's morning or *east* *: thus dispensing to this country in the cause of a complete solar revolution four months of heat, five or near six of cold and storms, and only two or three of temperate weather.

For some years it has been a general remark in the United States, that very perceptible partial changes in the climate took place, which displayed themselves in proportion as the land was cleared. 'Throughout Canada,' says Liancourt, 'it is observed, that the heats of summer become longer and more intense, and the cold of winter more moderate.' The same fact was observed by Kalm as early as 1749. In 1690 Lahontan writes: 'I am leaving Quebec, and I set sail on the 20th of november, a thing never seen before.' And in fact mercantile records confirm, as I have already observed, that about the year 1700 insurances for sailing from the river St. Lawrence were closed on the 11th of november, and now they continue open till christmas day.

Mr. S. Williams, the historian of Vermont, quotes a number of facts in support of this phenomenon. 'When our ancestors,' says he†,

* In our language the terms east and west do not include the ideas of rising and setting, as the French words here used, *orient* and *couchant*. T.

† Hist. of Vermont, p. 64 and following.

' came to New England, the seasons and the weather were uniform and regular: the winter set in about the end of november, and continued till the middle of february. During this period a cold, dry, and clear atmosphere prevailed, with little variation. Winter ended with the month of february: and when spring came, it came at once, without our sudden and repeated variations from cold to heat, and from heat to cold. The summer was suffocatingly hot; but it was confined to the space of six weeks. Autumn began with september, and the whole of the harvest was got in by the end of that month. The state of things is now very different in the part of New England inhabited since that time: the seasons are totally altered; the weather is infinitely more changeable; the winter is grown shorter, and interrupted by great and sudden thaws. Spring now offers us a perpetual fluctuation from cold to hot, and from hot to cold, extremely injurious to all vegetation: the heat of summer is less intense, but of longer continuance: autumn begins and ends later, and the harvest is not finished before the first week in november: in fine, winter does not display it's severity before the end of december.'

Such is the curious picture of the northern parts.

With regard to the middle states, Dr. Rush ad-

vances facts perfectly similar in Pennsylvania*. 'From the accounts which have been handed down to us by our ancestors,' says the doctor, 'there is reason to believe, that the climate of Pennsylvania has undergone a material change..... The springs are much colder, and the autumns more temperate than formerly, insomuch that cattle are not housed so soon by one month, as they were in former years..... Rivers freeze later, and do not remain so long covered with ice, &c.'

In Virginia, Mr. Jefferson likewise says: 'A change in our climate however is taking place very sensibly. Both heats and colds are become much more moderate within the memory even of the middle-aged.. Snows are less frequent and less deep.' p. 134.

Lastly, I myself have collected similar testimonies, throughout the whole course of my journey, as well on the Atlantic coast as in the western country. On the Ohio, at Gallipolis, at Washington in Kentucky, at Frankfort, at Lexington, at Cincinnati, at Louisville, at Niagara, at Albany, every where the same circumstances have been repeated to me: 'longer summers, later autumns, and also later harvests; shorter winters, snows less deep and

* See several papers by this physician in the American Museum, vols. VI and VII. A paper on the climate of New York, in vol. VII, confirms the same results.

of shorter duration, but cold not less intense. And in all the new settlements these changes have been represented to me not as gradual and progressive, but as rapid and almost sudden, in proportion to the extent to which the land is cleared.

A sensible alteration in the climate of the United States therefore is an incontestable fact; and when Dr. Rush, after having adduced the proofs of it, struck with the severity of several winters within these eight years, starts doubts respecting the precision of observations formerly made, in which thermometers were wanting, these doubts vanish before the multitude of witnesses and positive facts. The cause of this change, though it does not possess an equal share of evidence and certainty, has at least a degree of probability, capable of obtaining our assent. The opinion of Mr. Williams, who ascribes it to the clearing of the land, and the extensive openings made through the woods by cutting down the trees, appears to me the more solid, because he explains the fact by an analysis of the circumstances.

'In every district where wood is cut down to cultivate the land, the air and the earth undergo considerable alterations of temperature in the course of two or three years. The settler has scarcely cleared a few acres of the forest, before the ground, exposed to all the heat of the Sun's rays,

acquires to the depth of near a foot a heat of 10° or 11° beyond that of the land still covered with wood.'—*Hist. of Vermont*, p. 61, 62, 63.

Mr. Williams has deduced this estimation from some experiments, which he made for the purpose. Two thermometers, each put into the ground twelve inches deep, one in a cultivated and bare field, the other in the forest, or surrounding wood, even before the leaves were out, gave him the following results.

Date of the observation.	Heat in the field.	Heat in the forest.	Difference.
May 23	Fahr. 52°	46°	6°
28	57	48	9
June 15	64	51	13
27	62	51	11
July 16	62	51	11
30	65	55	10
Aug. 15	68	58	10
31	59½	55	4½
Sept. 15	59½	55	4½
Oct. 1	59½	55	4½
15	49	49	0
Nov. 1	43	43	0
16	43½	43½	0

Hence it follows, that in winter the temperature of the soil, whether covered or uncovered, is the

same; but in summer the difference is greater, in proportion as the temperature of the air is higher: which agrees very well with the remark of Umfreville, who says, that at Hudson's Bay the ground in open places thaws to the depth of four feet, and in the woods only to the depth of two: as it does with that of Belknap, who relates, that in New Hampshire the snow disappears from the cultivated land as early as the month of april, because the Sun has then acquired sufficient power about noon to melt it; but that it remains till may in woody places, though the trees are without leaves, being preserved from melting by the shade of the trunks and branches, and the general coolness of the air. This also very well accounts for the ancient state of things, as given by Mr. Williams; namely the duration of the winters, formerly longer and more uniform, with more abundant and deeper snows.

'Now,' continues this observer, 'the 10° of heat added to the open ground are communicated to the air, that is in contact with it.' And I will add, for this very reason the air, being heated, will ascend, and make room for a side wind from the woods, which considerably increases the body of warm air.

'2. Clearing away the wood causes the waters to evaporate, and the ground to become dry, as is daily remarked in all parts of the United States,

where brooks cease to flow, and marshes and swamps are converted into dry ground.' A farther reason for the diminution of cold and increase of heat in the atmosphere.

'3. Clearing the ground occasions a very sensible diminution of the quantity and duration of the snows, that less than a century ago covered the whole of New England for three months without interruption, that is to say, from the beginning of december to the beginning of march: and they are still the same in the uncleared land; while in the cultivated parts they are neither so lasting, nor so deep, nor so uninterrupted.

'4. Lastly, there is a very striking change in the winds: the ancient prevalence of those from the western quarter appears to diminish every day, and the easterly winds gain in frequency, as well as in the extent of their domains. Fifty years ago they scarcely reached thirty or forty miles from the seashore, and now in the spring they are frequently felt sixty miles, nay even as far as the mountains, which are seventy or eighty miles from the ocean. It is very evident, that they advance exactly in proportion as the country is cleared, and divested of wood.' The reason of this too is, the open ground being more heated, attracts more powerfully, or admits more easily, the air from the Atlantic coast.

Mr. Jefferson mentions a perfectly similar fact in Virginia. ‘ The eastern and south-eastern breezes come on generally in the afternoon. They have advanced into the country very sensibly within the memory of people now living. They formerly did not penetrate far above Williamsburg. They are now frequent at Richmond, and every now and then reach the mountains. They deposit most of their moisture however, before they get that far. As the lands become more cleared, it is probable they will extend still further westward.’ P. 128.

The change, effected in the climate of the United States, therefore, must be ascribed to two principal causes: 1st, the clearing of the ground, and the openings made in the continental forest, which produce a body of warm air, that is daily increasing: 2dly, the introduction of warm winds through these openings, which dries the country more rapidly, and heats the atmosphere more.

Consequently the same thing passes in America, as did formerly in Europe, and no doubt in Asia, and over the whole of the old world, where history represents the climate as much colder formerly, than it is at present. Horace and Juvenal mention the annual freezing of the Tiber, which is now a stranger to ice. Ovid gives a picture of the Thracian Bosphorus, which is no longer a

likeness: Dacia, Pannonia, the Crimea, and even Macedonia are represented to us as countries of frost equal to that of Moscow; yet at present the olive flourishes in them, and they produce excellent wines. Lastly our own Gaul in the days of Cæsar and of the emperor Julian had it's rivers frozen every winter, so as to serve for bridges and highways for several months; but such occurrences are now rare, and of very short duration*.

I cannot agree with Mr. Williams, however, in his opinion of the diminution, which he supposes to have taken place in the intensity of the cold since the 17th century. However plausible his reasoning may be, to prove, that the cold of 1633 was more powerful than that of 1782, attended with similar circumstances, and that both were the greatest ever known, it is merely hypothetical, and cannot supply the want of thermometrical observations in 1633†. We have par-

* If a fresh alteration in the temperature of the seasons, and in the nature of the wind that produces them, have been experienced in France within these ten years, I will venture to say, it is because the extensive cutting down of wood and destruction of forests, occasioned by the anarchy of the times during the revolution, has disturbed the equilibrium of the air, and the direction of the currents.

† Thermometers were not used in America till the year 1740, or thereabout.

ticularly reason to dispute his hypothesis, if, which I think I have proved, the north-west wind be the radical cause of cold on this continent: nothing indicates, that this cause has undergone any change in it's qualities; nay we are even authorised, to deny this diminution of the intensity of the cold from the analogy of a direct experiment made by Dr. Ramsay. This physician, having compared the observations of Dr. Chalmers, continued from 1750 to 1759, with his own made from 1790 to 1794, found but half a degree of difference in the intensity of the heat: now this quantity is so trifling, that we must ascribe it to the difference of the instruments; and if the heat, which ought to increase, have not varied, it is natural to suppose, that the cold remains the same. It appears to me then, that the only circumstances hitherto demonstrated are, that the winters are shorter, the summers longer, and the autumns later; without the cold having abated any thing of it's intensity: and this the last ten years have sufficiently proved. Mr. Mackenzie*, who confirms the changes I have mentioned, searches for a secret cause of them inherent in the Globe itself, because he has seen these changes display themselves in places where the land has not yet been

* Vol. III, p. 339.

cleared: but if these places, which he does not point out, be in Canada, they serve to support the theory I have advanced; because, the cutting down of certain screens of wood, on the crests of mountains or ridges in some districts of Kentucky and Genessee, would be sufficient to introduce considerable currents of wind from the south-west into the interiour of both Upper and Lower Canada. Sufficient attention has never yet been paid to this progress of the aerial currents, that skim the surface of the Earth, or to the effects they produce: but experience and observation will ultimately prove, that they have far greater influence over both local and general temperature than has been supposed *. I do not however dispute the possibility of any other cause, equally unknown to Mr. Mackenzie and myself.

Whether the climate of the United States be improved by these changes, is another question of much greater importance; and it is nearly answered by the comparison Mr. Williams has drawn between it's ancient and present state, which is not very favourable to the latter. Unfortunately

* For instance, it is owing to these, that certain districts are continually liable to storms of hail or thunder, while the country a mile or two off is habitually exempt from them.

his conclusion is confirmed by the observations of physicians. Dr. Rush, whose inquiries concerning the climate of Pennsylvania are the fruit of an extensive correspondence with his brethren, cannot avoid declaring, 'that bilious fevers have every where followed the cutting down of woods, the clearing of lands, and the drying of swamps: that several years cultivation are required, to mitigate them, or make them disappear:——that pleurisies and other purely inflammatory diseases, formerly almost the only disorders known, are now much less common; which proves an evident alteration in the purity of the air, at that time containing more oxygen, &c*.' These are such natural effects of the modern theories of the emanations from woods, and from ground newly turned up, that it is unnecessary, to enlarge upon

* That the general type of diseases has undergone a considerable change, and of the kind here mentioned, is certainly not peculiar to America; for it has been equally observed in this country, and is I believe pretty general: and though remittent fevers may be more frequent among those immediately employed in draining marshes, and cutting down woods, than they were formerly among persons less exposed to their exhalations, and fewer in number; this does not prove the climate in general to be rendered less healthy by drying the swamps and clearing the ground. Indeed I cannot perceive, that Rush says a word about either swamps or oxygen. See also p. 290. T.

the subject: but as a particular account of the inconveniences attached to the climate may have the advantage of indicating the means of prevention, by pointing out their causes, I will make this the particular subject of my inquiries in the following chapter.

CHAPTER XII.

Of the Prevailing Diseases in the United States.

Setting aside the disorders common to all countries, it appears to me, that there exist in the United States four leading diseases, the frequency and universality of which give them a right to be considered as the particular offspring of the soil and climate.

In the first class of these diseases are colds, catarrhs, and all the complaints that arise from suppression of perspiration, the symptoms and consequences of which vary, as is well known, according to the part they affect. Colds may be called the endemic disease of the United States. They

prevail in all seasons of the year, though naturally most in winter and about the vernal equinox; and are evidently occasioned by those sudden changes of temperature, which form the characteristic feature of the climate. They affect women more than men; whether because their skin is more delicate, and their way of life more sedentary and confined; or on account of their light and airy dress, the french fashions having already reached America. It must be confessed, that in order to obtain their introduction, even in the height of the revolution, these fashions were obliged to procure letters of naturalization from England: for it is necessary I should observe, for the instruction of the amateur and the important history of modes, that I found the Parisian dress of 1793 arrived at Philadelphia in 1795, and that of 1794 did not reach the same place till 1796; and when I was anxious to know what became of them during the intermediate years, I was informed, that they went to London, where they received the English stamp, for which the Americans have retained a filial respect. In the cities on the coast, where the people are eager to imitate Europeans, these colds have other causes in overheated apartments, balls, tea-parties, and featherbeds; sometimes indeed in the German fashion, that is, a featherbed to sleep on, and another as a coverlid.

Fits of coughing themselves are sufficiently weakening to the lungs, but they become particularly injurious by the repeated succession of colds. In the course of two winters I observed a great number of people of fashion had four or five relapses, for the rich are particularly liable to colds. The consequence is, that in a few years the lungs grow feeble, raw, and ulcerated; and becoming the receptacle or emunctory of all the vitiated humours in the whole body, the evil terminates in an incurable pulmonary consumption.

All travellers in the United States have spoken of the frequency of this fatal disease, which cuts off chiefly young married women and girls in the flower of youth and beauty. It is more common in New England and the middle states, than in the states of the south and west; the reason of which appears to me justly assigned by Dr. Currie of Liverpool*. He observes, that in Virginia and the Carolinas the warmth of the air occasions a determination to the skin, and thus carries off by copious perspiration all morbific humours, and the crudities of indigestion (which themselves are both the effects and causes of colds); while in the central and north-eastern states, the cold damp air, closing the powerful emunctory of the skin,

* See American Museum, Vol. V.

concentrates in the body those humours, which, to find an issue, attack every organ, and settle on that which affords least resistance*. I have reason to believe, that the very hot tea, which the Americans are accustomed to drink, contributes likewise to produce colds: for I frequently observed in them, as well as in myself, that the moisture it excites on the skin renders it more sensible of cold, and that I have frequently caught cold after a breakfast of tea, on going out in cool weather. I was told, that in my case it was for want of being accustomed to it: but if such be the effect of this liquor on a person unused to it, it is not less real, for being less marked, in those who are in the habit of drinking it. However, I shall soon have occasion to remark, that the whole of the

* I experienced in myself the justness of this theory on my return from Egypt. At Cairo I drank five or six cups of coffee daily, without any inconvenience. But leading a sedentary life at Paris, it became impossible for me even to drink a single cup fasting by the month of october, without exciting a nervous and febrile commotion. To this I may add, that, during the three years I spent in Syria and Egypt, I had no disorder except the influenza of 1783; while in the United States, in a similar period of three years, I had two very severe attacks of malignant fever, five or six violent colds, and rheumatic affections that have proved incurable: yet in both these countries I was equally conformable to the regimen pursued by the natives.

dietetic regimen of the Americans is calculated to undermine the best constitution, and that they live in a state of habitual indigestion extremely favourable to catching colds. At present I shall content myself with saying, that, since phthisis and consumption are derived from habitual colds, and colds themselves proceed from the habitual state of the air and it's too sudden variations, we have reason to consider these diseases as a particular effect of the climate.

2. Travellers are equally agreed on the frequency of defluxions on the gums, rottenness of the teeth, and the premature loss of these valuable instruments of mastication. Of a hundred persons under thirty, it may be affirmed, you will not find ten entirely unaffected in this respect. It is particularly lamentable to observe, almost generally, that handsome young women, from the age of fifteen or twenty, have their teeth disfigured with black spots, and frequently great part of them gone. Opinions differ, even among medical men, respecting the cause of a complaint so universal: some will have it to be the use of salt meat, which is in fact universal and habitual: others say it is to be ascribed to the use of tea, and the abuse of sweet things. Dr. Kalm, the Swedish physician, by comparing the regimens of various nations and different classes of society,

appears to me to have demonstrated, that tea does not injure the teeth as a saccharine liquor, or as an infusion of an acrid plant, but as a *too hot* drink: and indeed it is known of old by experience, that every kind of liquor too hot, even hot soup, occasions a painful sensibility in the teeth, which manifests itself if they subsequently come into contact with any thing cold. In fact a softening of their bony part takes place, that renders them *gelives**, as it is called, and prepares them for dissolution. This is no doubt the reason, why bad teeth are a universal complaint throughout the north of Europe; for in all cold countries hot liquors impart an agreeable sensation to the palate, the stomach, and the whole frame: while on the contrary cold drinks impart an agreeable sensation in hot countries: and it is remarkable, that in these the teeth are very generally sound and white, as we see among the Negroes, Arabs, Hindoos, &c.

A fact observed within these twenty years in the United States tends to corroborate this theory. Previous to that time a savage with a bad set of teeth was never seen; and the food of the savages is commonly cold. A few individuals, particularly

* I know not the meaning of this word here: applied to trees it signifies cracked by the frost. T.

women of the tribe of Oneidas, Senecas, and Tuscaroras, who live within the precincts of the United States, having adopted the use of tea, their teeth in less than three years became like those of the whites, disfigured with black spots and rottenness. Another fact mentioned by the circumnavigator Bougainville is perfectly analogous to this. He says, that the wretched icthyophagi of Tierra del Fuego, the Pesherays, have all bad teeth; and he adds, that they live almost entirely on shellfish, not raw, but roasted, and *eaten burning hot.*

I do not believe, however, that we are to reject as an auxiliary the use of salt meat; for it is indisputable, that the scurvy, the particular foe of the teeth, attacks all people who use this kind of food. If we even recollect, that one of the symptoms of this disease is stinking breath, which takes place more or less in those who have bad teeth; we shall conclude, that salt meat, the digestion and even the alcaline and semiputrescent chyle of which convey to the lungs exhalations of this kind, is in reality the primary and radical cause of caries; and that too hot liquors, while they directly dispose the teeth to it, both in themselves and by the subsequent contrast of the cold air, concur still farther by the property they have of debilitating the stomach, and vitiating the digestion. The

same cannot be laid to the charge of fresh meat, since the Tatars, the savages of North America, the Patagonians, and all carnivorous animals, as lions, wolves, dogs, &c., have the teeth perfectly white and sound. Neither can we lay the blame on sugar, or sweet things, since the Africans, Hindoos, and all other people, who use or abuse the sugarcane and saccharine fruits, have beautiful teeth, and that even the acid liquors generated by heat [*sucs acides des digestions*], an habitual case in hot countries, serve only to clean them. According to these remarks, it would be worthy the affection of parents, and the wisdom of physicians, in every country, to discountenance the use of hot liquors and salt meats, and in particular to proscribe their use to children and young persons. Were this done, defluxions arising from changes in the air, which are but secondary causes of the decay of the teeth, would exert but a very slight influence.

3. Autumnal intermittent fevers, or quotidian agues, tertians, quartans, &c., constitute another class of diseases, that prevail in the United States to a degree, of which no idea could be conceived. They are particularly endemic in places recently cleared, in valleys, on the border of waters, either running or stagnant, near ponds, lakes, mill-dams, marshes, &c. In the autumn of 1796, in a jour-

ney of more than seven hundred miles, I will venture to say I did not find twenty houses perfectly free from them: the whole course of the Ohio, a great part of Kentucky, all the environs of Lake Erie, and particularly the Genessee, and it's five or six lakes, the course of the Mohawk, &c., are annually visited by them. Setting off from Fort Cincinnati on the 8th of september with the convoy of the paymaster general of the army, major Swan, to go to fort Detroit, about two hundred and fifty miles distant, we did not encamp a single night without at least one of the twenty-five of us in company being seized with an intermittent fever. At Grenville, the magazine and head quarters of the army that had just conquered the country, of three hundred and seventy persons, or thereabout, three hundred had the fever. When we arrived at Detroit, there were but three of our company in health; and the day following both major Swan and I were taken dangerously ill with a malignant fever. This malignant fever annually visits the garrison of fort Miami, where it has already more than once assumed the character of the yellow fever.

These autumnal fevers are not directly fatal, but they gradually undermine the constitution, and very sensibly shorten life. Other travellers have observed before me, that in South Carolina, for

instance, a person is as old at fifty, as in Europe at sixty-five or seventy; and I have heard all the Englishmen, with whom I was acquainted in the United States, say, that their friends, who had been settled a few years in the southern or even central states, appeared to them to have grown as old again, as they would have done in England or Scotland. If these fevers once fix on a person at the end of october, they will not quit him the whole winter, but reduce him to a state of deplorable weakness and languor. Lower Canada and the cold countries adjacent are scarcely at all subject to them. They are more common in the temperate and flat country; and particularly on the seashore more than on the mountains. For this reason it might be supposed, that farmers would choose lands in a high situation; but as the soil is poor and less productive, they prefer the plain. Taught by the Americans to reduce every thing to calculation, I have sometimes reasoned with them thus. 'The plain, you say, and the low lands, yield you forty bushels of indian corn, or twenty of wheat, in a year: the land on the sides of mountains, either in Kentucky or Virginia, produces but half this quantity. Very good. But in the plain you are ill six months, and on the mountains you are able to work twelve: this renders both situations equal, except that on the

mountains you are cheerful and alert, and "health is better than wealth," as poor Richard says; while in the plain you are ill and low spirited one half of the year, and spend the other half in recovering your strength and preparing to go through another six months illness.' 'That is true, sir,' said a country clergyman to me one day, 'but in your equation you omit a very important term, a term more weighty here than perhaps in Europe, the advantage of being six months without having any thing to do.' The clergyman was certainly in the right, for I have frequently heard in Virginia, that the inhabitants of the coast of Norfolk prefer their aguish situation, abounding in fish and oysters, that cost little or nothing, to the healthy life of mountainous countries, where a table cannot be supplied without labour.

By a similar way of reasoning the favourite remedy of these patients is what they call bitters, of which brandy, rum, or Madeira wine is the basis: and perhaps the reader will be astonished to learn, that in reality this remedy is one of the most efficacious. I have met with several instances in Virginia and Pennsylvania of farmer's families, every person in which, who drank beer or water, was subject to agues, while the master of the house, who used spirituous liquors, and this even to excess, was constantly exempt from them. This

opinion appears to be generally adopted in Holland likewise, where smoking tobacco and drinking strong liquors are considered as preservatives against the ague and the effects of dampness. I have likewise known two instances, where drying up a small pond and a mill-stream radically delivered two families from the annual visitation of autumnal fever *.

Some observations I made in Corsica, during my residence there in 1792, are so closely connected with this important subject, that I cannot pass them over in silence. Fevers of the same kind regularly annoy several military posts in that island every year, and among others the little harbour of San Fiorenzo, bordering on a pestilential marsh of forty five acres. Toward the end of summer, and in the first six weeks of autumn, they assume a putrid and malignant character, in consequence of the intensity of the heat and the exhalations; and it is necessary to relieve the french garrisons every fifteen or twenty days, either wholly or in part, otherwise the soldiers would sink under their serious and ultimately mortal effects. Our physicians, after trying many remedies, remarked, that two posts alone in the whole island were absolutely exempt, and that no fever

* This tends to disprove, rather than confirm, the observations in p. 277. T.

ever approached forts Vivario and Vitzavona on Bogognano. Chance, as frequently happens, rendered the salubrious and even curative quality of these two situations more striking. A Swiss officer from the Grisons fell dangerously ill of the fever at San Fiorenzo, and having requested to be removed to fort Vivario, the garrison of which belonged to his own regiment, he was restored to life and health in less than a fortnight. The physician having repeated the experiment on some french soldiers in the hospital, it succeeded so well, that it is become the established practice, to send thither all the desperate cases of fever, which appear to be past the power of medicine; and it is observed, that the fever has never held out there beyond the eleventh day.

Now these two posts differ from all the rest, not only in being remote from any marsh or stagnant water, but in being placed like two eagle's nests on the chain of mountains, that divides the island in the midst throughout it's whole length. The elevation of the forts above the sea is about 2300 yards. Their temperature resembles that of Norway, or the middle Alps, much more than that of the island in general. The greatest heats there never exceed 16° or 17° [68° or 70° F.]; and they do not reach this, except in the three summer months. They are surrounded by snow

for three or four months; and sometimes to such a degree, as to have all communication with them cut off for eight or ten weeks. The ventilation there is constant, and frequently very violent, because they are situate at the two extremities of a narrow pass, which at that place separates the line of summits, formed by rocks for the most part impassable. It has been remarked, that fort Vitzavona, on the west side of the mountains, is damper than Vivario, and a little less healthy. Till the year 1793, the garrison of these two forts, consisting of fifteen or twenty soldiers in each, had been composed of Grisons, because these mountaineers, finding there a climate similar to their own, took delight in it, though leading a life sufficiently wearisome. Their diet, particularly in winter, was salt meat, sour-crout, beer and wine of inferiour quality, and very often biscuit instead of bread. Scarcely had they any open place to walk in, round the fort, or among the rocks; and during the six winter months it frequently happened, that they were completely confined within doors for a week or fortnight together, by the violent storms, rain, snow, or fogs, of which that region of clouds is then the theatre; in a word, their life was that of a party of marines at sea. I speak of these facts as an eye-witness, for I have visited these two singular habitations,

the most common disorder in which is pleurisy.

Their regimen cannot be the cause of such great health, since in the lower country it would certainly occasion agues and scurvy. The principle of health then must be in the quality of the air, which at this elevation of 2300 yards is pure, thin, and cool, while on the coast it is hot, damp, and loaded with exhalations of every kind.

Hence the first very simple indication of cure is change of air, and to choose a place where the atmosphere is known to be pure and elastic, such as it pretty commonly is on elevated spots in our climate. I do not make this circumstance of elevation a positive or general rule, for even in France we have lofty situations, which are unhealthy, and liable to fever*, because they are in the vicinity and to leeward of damp and marshy grounds. This is a much more common case in hot countries, and a number of hills and heights in Corsica and in Italy are wholly uninhabitable, because, though they are in some instances even at a considerable distance from any marsh, they have the serious inconvenience of being placed in the direction and *bed* of the most habitual wind, by which the emanations of marshes are brought to them.

* For example, the plain of Trappes, near Versailles, though high and open, is obnoxious to fevers, in consequence of the ponds of St. Cyr.

The same thing occurs in Bengal, where the British troops have found on woody heights, of the most inviting aspect in a hot country, the endemic described by their physicians under the name of *hill fever*. From this name it would scarcely be suspected of being the fever of low and marshy places, yet it is actually the same, being produced not merely by the extreme local dampness, occasioned by the enormous rains of the monsoons, but also by the evaporation of the whole plain of Bengal, the clouds of which are stopped and retained by the woods, that cover these mountains or chains. Lofty situations therefore must not be set down as healthy, unless they possess the necessary conditions of local dryness, shelter from noxious currents of air, and cool and free ventilation.

A second and more complicated indication is, to procure by art air of that kind or quality, which nature produces under certain circumstances on lofty places, and to neutralize the morbific gasses of noxious situations. Chymistry has made very happy and learned discoveries in this respect within these twenty years; and the sagacity, with which this science seems inspired, gives us reason to expect others from the distinguished men, by whom it is cultivated. They have demonstrated, that the principle in atmospheric air conducive

to respiration and life is the gas called oxygen; and that on the quantity of this contained in it depend it's purity and salubrity *, terms which have been employed with very vague ideas. The experiments of Lavoisier carried the proportion of this oxygen gas to twenty-seven parts in the hundred of atmospheric air, the seventy-three remaining being azot. Those of Berthollet have since reduced the oxygen gas to twenty-two parts and half: and perhaps this difference does not imply any mistake or contradiction, since it is probable, that the proportion varies according to the winds that prevail. It must equally vary in different countries: and it would be an interesting investigation, to pursue the inquiry in very opposite climates, and to compare the cold dry air of Siberia with a hot and damp air, as that of the West Indies †, or with a hot and dry air, as that

* This is generalizing a little too much, as appears from what the author has said already, and what he proceeds to observe. T.

† An American physician made experiments at Martinico in 1796, in the presence of four English physicians, from which he concluded, that the atmospheric air in that island contained sixty seven parts of oxygen in the hundred. I informed cit. Fourcroy of this experiment, who supposes, that some mistake crept into it, and that life could not long be sustained with such a proportion. The experiments of Humboldt in South America confirm those of Europe.

of Egypt and Arabia; and likewise to compare the strata of air near the Earth with those of the middle and upper regions; for which purpose balloons may be of use. At present it appears certain, that in our temperate zones the air is more pure on heights only because it contains more oxygen and a smaller quantity of exhalations; and in the instances already mentioned of Vitzavona and Vivario, the specific gravity of the oxygen gas, which a little exceeds that of the atmospheric air, is not a contradictory circumstance, since the coolness of the place must retain and fix it there in preference to the burning coast, from which it would be expelled.

On the other hand, recent experiments have proved, that oxygenated muriatic acid gas possesses in an eminent degree the quality of freeing atmospheric air from infectious miasmata, that is, of neutralizing and destroying the morbific gasses contained in it. Were this a mean of preserving from disease alone, it would be a valuable benefit for it's simplicity and efficacy: but much remains for us to learn respecting the various species of pernicious gasses that float in the air, and their mode of attacking health and life; I say the *various species*, for in fact there are some of such a subtile nature, that no instrument has hitherto been able to detect

them. To judge of these gasses by their effects, they may be considered as poisons, the particles of which act on the fluids sometimes of the sanguineous, at other times of the nervous system, in the mode of fermenting leavens, which, when applied to a mass, produce in it an intestine motion, the progress of which increases rapidly. The action of different gasses, and particularly of the oxygenated muriatic, which annihilates life without any shock, and without any warning, not by respiration alone, but even by cutaneous absorption, affords an example of activity, that may not be confined to these. To such causes must be ascribed those epidemics, the attack of which is so sudden in certain constitutions of the atmosphere, and in certain countries: and as to febrile diseases, particularly those accompanied with shivering fits and periodical accessions, if we recollect, that in their regular returns of twelve, twenty four, thirty six hours, &c., they pursue a course similar to that of several essential functions of life, as sleep, hunger, &c., we shall be led to believe, that the focus of perturbation is neither in the first passages, nor in the blood, but in the immediate organ of vitality, the nervous system. It is by some unknown action on the fluid by which the medullary part of the nerves is moistened, that fever in general displays itself so

suddenly, requiring only an exposure to the fervent rays of the Sun, a current of cold air, a shower of rain, or a sudden transition from heat to cold, or the contrary. If we add, that it manifests itself particularly in seasons and in places subject to vicissitudes of heat and cold; that itself is nothing but a sensation of alternate cold and heat; that the sweat following the paroxysm is a particular symptom of every contraction of the nerves; the focus I have pointed out will acquire an additional degree of probability: and then the mechanism of contagions will become evident and simple, since the lungs and interiour part of the nose bring an immense body of nerves into immediate contact with the miasmata, that float in the air inhaled in respiration; and we shall understand why drugs and remedies, swallowed in a liquid or a solid form, are less efficacious in curing fevers, particularly of the autumnal kind, than change of air and the respiration of the oxygenated atmosphere of Vitzavona and Vivario.

§ IV. *Of the Yellow Fever.*

The disease too well known by the name of yellow fever grows more and more common in the

United States; and I shall speak of it at some length on account of the importance of the subject. Besides, as I was originally intended for the practice of physic, the studies of my younger days enabled me to reason upon this disorder with professional men, and discuss the various opinions entertained concerning it, though with the diffidence becoming one who has only had a glimpse of the extensive career. Had I not been thus far qualified, I should have refrained from meddling with the subject: for to talk of physic without having studied the art, is like discoursing of astronomy, mechanics, or military skill, without any preliminary information. Nay, it would be possible to reason better on these sciences, as their principles are fixed and simple; while those of physic, though they possess a certain degree of regularity, are subject to complex and variable circumstances, that require a delicacy of tact, an accuracy of comprehension, a promptitude of application, the difficulty of which constitutes their merit. To say, as we hear people daily, that every thing in physic is chance and conjecture, is an absurdity the more glaring, because these very persons begin with a confession, that they know nothing of the matter: but how can a man form any judgment on a subject, of which he is wholly ignorant? Accordingly

at the least scratch these Galens born send for the physician, happy while waiting his arrival if they can procure a nurse, who is herself an outline of medical science, in consequence of the facts and observations she has collected by practice. But to return to the yellow fever.

The name of this disease is derived from one of it's characteristic symptoms, a deep lemon colour, which, in the dissolved state of the humours, the eyes first acquire, and then the skin all over the body. It is called by the French *fièvre* or *mal de Siam*, the *Siam fever or sickness*, either because it first came from that country, or because the colour of it's inhabitants much resembles that of people who labour under it. The Spaniards call it *vomito prêto*, the *black vomit*, from another severe symptom by which it is distinguished. The most common and general symptoms are the following, which succeed each other rapidly in the short space before the disease decides itself for life or death (commonly three days).

Some days preceding the attack there is a general sense of lassitude, pains in the limbs, drowsiness, and sometimes stupor. The fever declares itself by a violent headach, particularly over the eyes and behind their orbits: the patient complains of pains along the spine of the back, in the arms, and in the legs: great heat and shivering alternately succeed

each other. The skin is dry, burning hot, and frequently marked with spots, first reddish, then violet coloured: the white of the eyes is blood-shotten, and moistened with a shining dew: respiration is oppressed, with frequent sighs, and the air emitted from the lungs is burning hot: the pulse is various, according to the constitution of the patient and different circumstances: in general it is hard, frequent, irregular, and even intermittent; if it resemble the natural state, the danger is greater: faintings and deafness at the commencement of the disorder are likewise a threatening symptom: the thirst is great; the tongue, at first red, becomes covered with a blackish fur, which grows fetid. The patient complains of a violent heat at the stomach: the vomitings change from slimy to the most corrosive acid, sometimes without bile, more frequently with green and yellow bile, and then a blackish matter like the dregs of ink or grounds of coffee, with a smell of rotten eggs, and so acrid, that the throat is excoriated by it: frequently constipation takes place, at other times there is a blackish diarrhœa.

The disorder has now run through the inflammatory stage, in consequence of which the fluids are decomposed: the fever seems to abate, but it is in consequence of the decline of the vital powers themselves: the pulse becomes small, convulsive,

depressed: the patient is restless, uneasy, sometimes delirious: the colliquative and fetid stools, and the black vomit like coffee-grounds, weaken the patient more and more by their copiousness and abundance: he affects the ominous position of *lying on the back, raising up the knees, and sliding down toward the foot of the bed:* the eyes become yellow, and then the skin of the whole body: at this period the dissolution of the fluids is complete. If the patient were bled at the beginning of the disorder, the cicatrices grow soft and open again: gangrene and sphacelus attack the solids, and display themselves every where with that noisome smell, which announces the approach of death.

The yellow fever has been long known in the hot and marshy parts of South America, and in the archipelago of the West India islands. Instances of it were frequent at Carthagena, Porto Bello, la Vera Cruz, Jamaica, St. Lucia, St. Domingo, and Martinico. Even Louisiana, and the coasts of the Floridas, of Georgia, of the Carolinas, and of Virginia, came in for their share, owing to the same causes, heat and moisture. New Orleans, Pensacola, Savannah, Charlestown, and Norfolk, were seldom four or five years without some attack from it. It seems as if the Potowmack were it's boundary, since toward the conclu-

sion of the last century only the years 1740 and 1762 were mentioned, in which it had appeared to the north of that river, first at New York, then at Philadelphia: but subsequently to the year 1790 it's visits have been so often repeated, and so fatal, that it seems to have naturalized itself there as well as in the south. Some single cases occurred at New York in 1790: in 1791 it became an epidemical scourge of that city, and left traces of itself there in 1792. The following year, 1793, it ravaged Philadelphia as a pestilence; and it's germes, there deposited or revived, displayed themselves again in the summer of 1794 and 1795. It attacked New York afresh in 1794 and 1796, Philadelphia in 1797, and at the same period it laid waste Baltimore, Norfolk, Charlestown, and Newbury-Port. It's harbingers had shown themselves at Sheffield, and even at Boston. Other instances besides are mentioned; one at Harrisburg in 1793, another at Baltimore, and one at Oneida in Genessee; to which I might add several cases at the English fort on the Miami of lake Erie.

The American physicians, to whom this disease was new, had to invent a method of cure adapted to their climate and the constitutions of the people. Unfortunately, I will venture to say, most of them were too ready to suppose, that they had found it

in the theoretical principles of Brown, whose doctrines were embraced by many in the United States with the enthusiasm of disciples. This system, which accounts for every thing by two simple states of direct and indirect debility, and the subtraction or application of stimuli likewise direct and indirect, made so many the more proselytes, because it possessed that peremptory and decisive character, of which youth are enamoured, and dispenses with the slowness of experience, so dreaded by idleness at all ages. Reasoning then with this dangerous confidence of certainty, which excludes doubt and observation, they have commonly administered the most active tonics and cordials at the commencement of the disorder; pretending, that it was necessary to rouse the sinking powers, when the object should have been, to relax the overtense fibres: to these they added the most stimulant drastic purgatives, to expel the morbific humours, when these humours were not yet in a state of concoction.

This treatment was particularly employed at Philadelphia in the fatal year of 1793. The most general practice of the physicians of that city was, to administer twenty or five and twenty grains of jalap; ten or fifteen grains of calomel; or even gamboge; and all of these in repeated doses. For drink, they ordered camomile, mint, or cinnamon

tea, and Madeira wine to the quantity of more than a pint * a day. Now it is well known, that a portion of brandy enters into the original fabrication of the best Madeira. Besides, in the months of august and september, and in a climate where Reaumur's thermometer is at 25° [88° F.] with calm and suffocating weather, the sick were kept closely shut up in their chambers; two or three blankets were laid on their *feather-beds*; and sometimes a fire was kept in their rooms: the object of which was peremptorily to force a sweat, still more obstinately refused by the inflammatory and parched state of the whole system.

The consequences of this treatment were such as might have been expected; a mortality alarming by the numbers it destroyed, and the celerity with which they were carried off: few survived the third day, and not two out of fifty recovered. All had symptoms of gangrenous suffocation, the natural consequence of an inflammation cherished: terrour seized every mind: the disease was looked upon as contagious and pestilential, and it's attack as incurable. Some physicians, who had obtained considerable weight through their wit and activity, confirmed this pernicious rumour even in the

* If the French pint be here meant, it should probably have been translated *bottle*, as the French pint is equal to our quart. T.

public papers. Every sick person was deserted; the husband by his wife, parents by their children, and even children by their parents. The houses forsaken remained noisome with the stench of the dead. Government interposed, first to compel the removal of every corpse, and then to oblige the sick to be conveyed to the hospital. Houses were marked with chalk, as in a time of proscription, and the distracted inhabitants fled to the neighbouring villages; or encamped in the open country, as if their city had been taken by an enemy.

In this state of affairs, Chance ordained that some French physicians and surgeons, fleeing from Cape Français, then laid waste by fire, should seek an asylum on the continent: one of them, guided to Philadelphia *, happened to be called to a patient; and applying to the disorder, similar cases to which he had seen in St. Domingo, the treatment of the French school, he obtained such success as attracted the notice of the government, and occasioned him to be placed at the head of the hospital at Bush Hill. The account of his method of cure †, published by him the year following, does equal honour to his heart and head,

* Mr. John de Veze, formerly a distinguished surgeon of great reputation at Cape Français.

† See Inquiries and Observations concerning the epide-

since it spread new and salutary ideas throughout the country. It appears by this tract, that he considers the disorder as divided into three stages, which ought not to be confounded with each other, but which sometimes proceed with such rapidity, that the physician has scarcely time to distinguish them. The first is a state of violent inflammation, complicated with turgidity of the brain, and nervous spasm, requiring sedatives and relaxants, not tonics. The second is a state of dissolution and separation of the fluids, the combination of which has been broken by the inflammatory heat. This can be terminated only by the evacuation of the fluids, that are become unfit for vital circulation, and injurious to it: and in this stage art should be contented to assist the crisis, by following nature rather than stepping before her. Lastly, the third is a state of recomposition and recombination, in which the physician has only to superintend the regimen of the convalescent.

In consequence, at the commencement of the disorder, he took away small quantities of blood, if the patient were plethoric: he administered diluents, acidulous aromatic drinks, and obtained happy effects from liquors impregnated with car-

mic Disorder, that has ravaged Philadelphia from august to december 1793; 8vo, 145 pages, in French and English, Philadelphia, 1794.

bonic acid. He tried what kind of drink was most agreeable to that capricious organ the stomach: he fortified the mind against the idea of contagion, the existence of which he positively denied throughout the whole of the epidemic. He admitted fresh air, and did not provoke sweating, which, he observes, Nature scarcely ever employs as the medium of a crisis.

When this preliminary treatment had moderated the fever, he made it his business in the second stage to watch Nature's attempts for effecting a crisis, and choosing some organ for it's seat. Commonly it was by extensive suppurations: these he favoured, and endeavoured to guide by the external application of vesicatories and cataplasms, while internally he aided the process by drinks aromatized with mint and cinnamon, and even Bordeaux wine diluted with water and sweetened with sugar; by a few gentle purgatives in small doses; and lastly by the bark. Opium, so much vaunted by the American physicians, never appeared to him to have any good effect.

It may be supposed, as it is a common case in all countries, that a single unconnected foreigner could not obtain such a degree of confidence and success without opposition, and without a struggle; but at length, by the no less natural course of things, truth and reason made their way by dint of

proofs and facts. The sick sent in preference for the physician, who performed most cures, and many practitioners at length adopted his method.

Whether the pamphlet of Mr. de Veze, and the cures performed by him and other French physicians, had a happy influence on men's minds; or their own reasoning and experience corrected their ideas, and dissipated ancient prejudices; this at least is true, that fortunate changes began to be introduced both in theory and practice from that period. The year following, 1794, in the epidemic of New York, several physicians of that city substituted instead of drastic purgatives different salts, and among the rest Glauber's, which succeeded in diluents. They were no longer prodigal of tonics or Madeira wine: they employed bleeding with discretion: if they still provoked sweating, it was by means of the warm bath, and fomentations with vinegar, which sometimes afforded ease: and from that moment a salutary schism took place in the colleges, which has shaken old habits, and opened new paths to science and the spirit of observation.

This schism has been particularly notorious on the question concerning the origin of the yellow fever. Some have pretended, that it was always imported from abroad, particularly from the West Indies, and that it was not, and could not in any

case be the native produce of the United States. In proof of their opinion they have advanced the nonexistence or extreme rarity of epidemics before the peace of 1783; and they have ascribed their frequency since that period to their more active and more direct commercial intercourse with the West India islands and the Spanish main. They have even charged certain vessels by name with having imported the *contagion*, the existence of which they have supposed in a degree little inferiour to the plague.

Other physicians on the contrary have maintained, that from it's very nature the yellow fever might arise in the United States, as often as it's disposing and occasional causes of time and place occurred together: and, in the first place, tracing to their source the pretended facts of importation, they have demonstrated by the most positive testimonies, not only that the vessels accused of having brought with them the disease or it's germes did no such thing, but that it did not appear on board them till after they had moored at the quays and in the vicinity of the places, which were noted at New York and Philadelphia as the foci of the evil; with this additional peculiarity, that it had even seized those of the crews first, who had had the most immediate contact with the infectious

place *: then, collecting all the circumstances of the disease, with regard to place, season, and the constitutions of the sick, they have demonstrated.

1st, that it attacked populous cities, in preference to villages and country situations.

2dly, that in populous cities, as New York, Philadelphia, Baltimore, it affected constantly and almost exclusively the low parts, full of filth and stagnant water; streets not ventilated, not paved, and dirty; and particularly the quays and their vicinity covered with nastiness to an inconceivable

* Thus the whole city of Philadelphia was persuaded, that the epidemic of 1793 came from the island of Grenada, to which they said it had been brought from Bulam, on the coast of Africa, by the ship Hankey. An English physician, who happened to be at that island, gave great weight to the authenticity of this second part of the story in a pamphlet he wrote: yet three years after, Mr. Noah Webster and Dr. E. H. Smith published at New York a journal of the whole voyage of the Hankey, drawn up by one of the most respectable eyewitnesses, which contains such a great body of proof, and bears so obvious a stamp of candour and veracity, that the reader is convinced, as well as Mr. Webster and Dr. Smith, of Dr. C.'s having been completely deceived. In like manner Mr. Rich. Bayley proves, in his excellent report to the governor of New York, that the accusations brought against the vessels Antoinette and Patty were vulgar rumours completely destitute of foundation, &c. See New York Medical Repository, 2d ed., Vol. I, p. 459, and 121.

degree ; where every day at low water the muddy shores are exposed to an ardent Sun. At New York, for instance, Mr. R. Bayley has calculated, that, to fill up the dock between the Whitehall and Exchange slip, twenty-four loads of every kind of filth, including even carcases of horses, dogs, &c., were used in one year : whence it followed, that in july the stench was so powerful in the neighbourhood, as to excite nausea and vomiting, the precursors of the epidemic, especially in the evenings.

3dly, that with regard to the course of the seasons, it appeared only in july, august, and september ; that is at the period when the obstinate and intense heats of 24° or 25° Reaumur [86° or 88° F.] excite an evident fermentation in these heaps of animal and vegetable matter, and disengage from them miasmata, which every thing indicates to be the destroyers of health. These physicians have remarked, that the epidemic redoubled it's fury if the weather were damp, or the wind south-east or even north-east ; that it was diminished by the cold and dryness of the north-west wind, and even by the copious rains of the south-west : that in the difference of years the fever selected those, in which the heats of summer were accompanied with most dryness and calm in the air ; no doubt because then the accumulated miasmata exercised

a more powerful action on the lungs, and by their means on the whole circulation.

Lastly, they have demonstrated, that in the choice of subjects it attacks in preference the badly fed and dirty inhabitants of the suburbs and quarters abounding in filth and marshes; workmen exposed to the heat of fires, as smiths and jewellers; and those who were addicted to spirituous liquors: observing, that frequently the yellow fever has immediately succeeded a fit of drunkenness; that it attacks also more particularly people of full, sanguine, robust habits, adults of warm constitutions, foreigners from northern climates, blacks, and men debilitated by libertinism: that it spares foreigners from hot countries, people temperate in drinking and more particularly in eating; they who are in easy circumstances, cleanly in their persons, living more on vegetable than animal food, and residing in paved, airy streets, and high situations.

Farther, following the malady even to the places pointed out as the cradle and focus of it's origin, they have demonstrated, that even in the West Indies, in the islands of Grenada, Martinico, St. Domingo, and Jamaica, the yellow fever arose only where the same circumstances were combined; that it shows itself only in certain places and particular years, exactly similar to the cases men-

tioned in the United States; that places where there is neither marsh nor filth, as St. Kit's, St. Vincent's, Tobago, and Barbadoes, are constantly healthy: that, if the fever have appeared at St. George's, in Grenada, and at Fort Royal, in Martinico, it was at the careenage, near noisome marshes, and at a time when a superabundance of vessels, and the excessive dryness of the season, had contributed to the developement of ferments: that, if it's appearance in the cities of New York, Baltimore, and Philadelphia, had been owing only to importation, it must have been brought to them habitually from Norfolk and Charlestown, with which they had an extensive intercourse, and where the combination of all the causes above-mentioned rendered it almost endemic every summer.

The facts, on which these conclusions are founded, are dispersed through different tracts, published from 1794 to 1798, the time when I left the United States*.

* See the Report of the physicians of Philadelphia to the governor of Pennsylvania: that of Mr. Rich. Bayley to the governor of New York: the Inquiry into the Cause of the Prevalence of the Yellow Fever in New York, by Dr. Valentine Seaman: Dr. Rush's Medical Inquiries and Observations: a letter from Dr. G. Davidson, on the Reappearance of the Yellow Fever at Martinico in 1796: Origin of the Pestilential Fever that prevailed in the Island of Grenada

It is impossible to read them attentively, and not be struck with the constant harmony and correspondence, that every where exist between the primary and secondary causes, mediate or immediate, the concomitant circumstances, and the effects, either isolated, or combined into a series. Every where we find the fever originating and increasing in the compound ratio of the heat of the atmosphere, of it's continued dryness or temporary humidity, of it's calmness, of the vicinity and extent of marshes, and especially of the accumulated heaps of animal matter, forming a focus of putrefaction and deleterious effluvia. We even see the fevers are more or less violent according to the intensity of all these causes: if there be only excess of heat, without masses of putrefaction, and without marshes, they are simply of the inflammatory kind, that is scarlatina and bilious fever, without any complication of malignity: if there be muddy marshes, unimpregnated with animal matter, the miasmata occasion putrid sore-throat, the severe bilious vomitings called *cholera morbus*, and

in 1793 and 1794, by Dr. E. H. Smith: an Inaugural Dissertation on the Bilious Malignant Fever, by S. Brown: Account of the Bilious Fever and Dysentery that prevailed at Sheffield, in Massachusetts, by Dr. W. Buel: and lastly the very interesting Collection of Letters on the Fevers of various Places, published by Noah Webster of New York.

destructive dysenteries: if to these be added accumulations of putrefying animal matter, the disorder becomes complicated with symptoms, that always denote the nervous system to be affected by a kind of poison: when the evil is at it's *maximum*, all the other degrees have a tendency to assimilate with it. Whence it follows, that fevers may be graduated and measured by the degrees of the thermometer and intensity of putrid miasmata; and that in the course of the same summer and autumn we may follow their progress and affinity from simple synocha to the plague, which is but the last degree in the scale, and the *maximum* of these causes united. In such a state of things it is evident, that every country, where heat and centres of putrefaction are united to a sufficient degree, will be capable of engendering all these diseases. I had already imagined, that I had observed in Egypt and Syria a heat of 24.° of Reaumur [86° F.] to be the point at which a febrile disposition and commotion of a destructive kind, denoted by the term of *malignant fevers*, took place in the blood: and it was with surprise and pleasure I saw the same opinion had been suggested to Dr. G. Davidson, at Martinico, by similar facts; and that he thought with me, that setting out from this degree, equal to 86° of Fahrenheit, the characters of malignity and conta-

gion are exalted as the heat rises, till at length they form the plague.

Through the means of the writings and facts I have quoted, these principles have acquired such a degree of evidence in the United States, that a very great majority of the physicians of New York, Boston, Baltimore, Norfolk, and Charlestown have joined in declaring, that the yellow fever might and actually did arise in the United States. The college of Philadelphia alone has persisted in affirming it's importation; and this opinion, which has in it's favour the advantage of precedence in the minds of the common people, will long have partisans in every class from several very potent motives: as

1st, Because it flatters national vanity, and many persons want only a pretext, to authorize their own.

2dly, Because it favours the interest of jobbers in the sale of lands, and the emigration of foreigners to a country, which enjoys the privilege of not engendering fever. It is true, that, if it be so apt to receive it by inoculation, the case is almost as bad; but the partisans of it's importation cannot take a joke, and I have found many Americans, who were seriously put out of temper by contradiction on this subject.

3dly, Because those physicians, who first esta-

blished this belief, are so engaged by self-love or supposed conviction*, that they have almost prohibited to themselves the least modification of it; and because they have made the government take measures so decisive, and so burdensome to commerce, that if they were now found to have been adopted

* The reader may judge of this by the doctrine of one of the professors of the greatest sway in Philadelphia, which he promulgated in a lecture that closed his course, and which was related to me immediately by some of his auditors. After having recapitulated the methods taught during the winter of 1797, and among others that of bleeding as far as a hundred ounces in various cases of yellow fever, he said to his pupils: 'gentlemen, we are now about to separate, and you are going to be dispersed over the vast surface of the United States: spread every where the truths you have heard in this place. You will meet with contradictors, with enemies! resist them courageously, and be persuaded, that by firmness and constancy you will render the *true doctrine* triumphant.' Ite et evangelizate.

Assuredly if there be a dangerous doctrine, particularly in the art of physic, it is that which excludes philosophic doubt, without which the mind remains closed against all instruction, all correction of errour: and this doctrine is particularly pernicious to young persons, in whom the desire of knowing and the want of believing are associated with the want of loving, and who attach themselves to opinions in consequence of their attachments to masters. Accordingly one of the most fertile sources of errour, fanaticism, and misery, has been, and still is, that fatal musulman principle of education, adopted in every species of tuition.

without reason, the authors would infallibly incur ill-will. Yet I consider those offices of health or lazarettoes in the ports of the United States as a wise institution, particularly if the Americans trade up the Mediterranean and in the Levant.

4thly, and lastly, because the contagious and almost pestilential character, which is joined with the prejudice of importation, very happily excuses the want of success of those, whose patients very seldom recover.

While I adopt the opinion of those physicians, who consider the yellow fever as an indigenous product of the United States, I am far from inculpating the intention of those, who support the opposite side of the question: but I consider the doctrine of importation as dangerous and imprudent; both on account of the dogmatic and intolerant tone it has assumed, so far as to attack domestic liberty and security, and to compromise the government; and because, in urging extravagant external measures, it has rendered men indifferent to internal steps of far greater necessity, that flow directly from the opposite opinion.

As to the question of it's contagious character, I can neither admit the absolute negative mentioned by some physicians, nor the general and constant case supposed by several others. The latter is controverted by too many incontestible facts:

and the former, that is the negative, seems to me inconsistent with the very origin of the disorder; for if marsh miasmata and putrid matters possess the property of exciting it, surely *a fortiori* the miasmata of an infected human body must have this quality, their affinity with the living fluids being much greater. Accordingly it was remarked at Philadelphia in 1797, that several families, on returning from the country to their houses in town, in which some persons had been sick or died, without taking care to purify it from infection, were immediately seized with the disorder, notwithstanding the weather was cold, and it had disappeared. At Norfolk it was a still more general remark, that they who had removed from the city were more exposed to catch the disorder, than they who remained constantly in it's atmosphere; and this case corresponds with that of strangers, particularly from the north, who were observed at Philadelphia, New York, &c., to be particularly liable to attack.

The men of theory endeavour to explain this singularity by saying, that strangers are more susceptible of the fever in consequence of a superabundance of oxygen being infused into the blood by the purer air of Europe or the country. But, not to mention that this superabundance of oxygen is merely hypothetical, the ideas we have of oxygen

gas, essentially conducive to health, are so contrary to it, that we have a right to demand stronger proofs; and to assert, as they do, that oxygen is more abundant in low situations than in high, is a new supposition in chymistry, so much the less admissible, as the most learned chymists in Europe consider the contrary as proved. It is not oxygen, that their experiments have shown them to be disengaged from marshes and putrid matters, but carbon, hydrogen, and azot: it even appears, that the combination of the first two of these gasses has the specific property of generating intermitting and remitting fevers, and that these do not become putrid but by the addition of azot to the compound.

Farther study no doubt will unfold the action of all these morbific gasses: at present, the best indications of cure appear to be: 1, to counteract the inflammation, which is the first stage of the disorder, by diluents and refrigerants: perhaps baths at such a temperature as to excite a slight shivering* would be among the most efficacious, employed on the first suspicion of the disorder, and continued for eight or ten hours. I leave it to the masters of the art, to decide on very cold baths, even near the freezing point, from which some American

* Of 10° or 15° [55° or 60°] according to the feelings of the patient.

physicians assert they have obtained good effects: it is certain, that in cases of phrensy they have sometimes effected astonishing cures; but the period of their application has a decisive influence, since their effect in the inflammatory stage is very different from what it would be in the succeeding. The remedies employed against asphixy too may be of use, since deleterious gasses appear to act a part in the disease. The essential object is, to prevent inflammation from increasing to such a degree, as to decompose the fluids; for in this case nothing can prevent the disorder from running through all it's three stages. Accordingly the first few hours are decisive, and require all the celerity possible; and in them taking away blood in small quantities may be of great utility. An all-powerful preservative is the most rigid abstinence*, with aqueous drinks, as soon as a sensation of heaviness is felt, with lassitude, and loss of appetite: and it must be continued strictly two or three days, till the calls of hunger return, and both mind and body resume their wonted alacrity.

With regard to general preservatives, applicable to the cities of the United States, these depend on the central government, and consist:

* See an excellent paper on the Effects of Abstinence at the Approach of Acute Diseases, by Ed. Miller, M. D., New York Medical Repository, 2d. Ed., Vol. i, p. 187.

1. In regulating the strictness of quarantine, as well authenticated cases of disorders imported in ships may require. Vessels from the Mediterranean demand most attention.

2. In prohibiting the abuse of the pretended right of property, and of the liberty of individuals, who in the vicinity, nay even in the heart of great cities, fill up low grounds with filth, and even carrion. The Americans boast of their cleanliness; but I can assert, that the quays of New York and Philadelphia, with certain parts of the suburbs, exceed in public and private nastiness any thing I ever beheld in Turkey, where the air has the advantage of salubrious dryness.

3. In establishing regulations of police, hitherto unadopted or neglected, for the paving of the streets, suburbs, and even hearts of cities. It has been observed in Europe, that the great epidemics of Paris, Lyon, London, and other very populous cities, have ceased since the establishment of a general and regular pavement.

4. In preventing any stagnant water, accumulation of putrid matters; in removing from the heart of cities extensive burying-grounds, the pestilential use of which is generally retained with superstitious respect. Philadelphia has four vast cemeteries in the handsomest quarter of the city, of the smell of which I was very sensible in summer,

and it has not one walk planted with salutary verdure.

5. In obliging the cities to wall and pave their privies, which in their present state communicate so directly through a sandy soil with the wells, equally left destitute of walls, that on the melting of the snow in winter, and during the droughts of summer, the water in both may be seen to assume the same level. It is so true, that the water drunk in the lower parts of the city receives filtrations from the cemeteries and privies, that in Front street I found the water in my decanters become *ropy*, if kept three days in the month of may, and at length acquire a cadaverous stench*.

Lastly, the government, while it directs the attention of the inhabitants of the United States to these objects of domestic concern, should promote their being properly instructed with respect to one of the most essential and most radical causes of all their diseases, I mean their dietetic regimen which in consequence of their origin they have derived from the English and Germans. I will ven-

* Since my departure, Philadelphia is indebted to the talents of the engineer Mr. Latrobe-Bonneval for a steam-engine, which supplies it with the waters of the Schuylkill. A similar improvement has taken place at New York; and it is to be wished, that the inhabitants of other parts would imitate such a salutary example.

ture to say, that, if a prize were proposed for the scheme of a regimen most calculated to injure the stomach, the teeth, and the health in general, no better could be invented than that of the Americans. In the morning at breakfast, they deluge their stomach with a quart of hot water, impregnated with tea, or so slightly with coffee, that it is mere coloured water: and they swallow, almost without chewing, hot bread, half baked, toast soaked in butter, cheese of the fattest kind, slices of salt or hung beef, ham, &c., all which are nearly insoluble. At dinner they have boiled pastes under the name of puddings, and the fattest are esteemed the most delicious: all their sauces, even for roast beef, are melted butter: their turnips and potatoes swim in hog's lard, butter, or fat: under the name of pie, or pumkin, their pastry is nothing but a greasy paste, never sufficiently baked: to digest these viscous substances, they take tea almost instantly after dinner, making it so strong, that it is absolutely bitter to the taste; in which state it affects the nerves so powerfully, that even the English find it brings on a more obstinate restlessness than coffee. Supper again introduces salt meats, or oysters: as Chatelux says, the whole day passes in heaping indigestions on one another: and to give tone to the poor relaxed and wearied stomach, they drink Madeira, rum, French brandy,

gin, or malt spirits, which complete the ruin of the nervous system.

Such a regimen might agree with the Tatars, the primitive stock of the Germans and Anglo-saxons, who used none of these dangerous stimuli. Their equestrian and erratic life rendered and still renders them capable of digesting any thing: but when nations change their climate, or by the progress of civilization become wealthy and idle, they experience as a whole the changes that take place in individuals. The ploughmen or mechanics of England and Germany may live on the diet of their ancestors without inconvenience: but it is not the same with the inhabitants of cities; still less with those, who, emigrating from their cold and damp climate, settle in hot countries like Georgia, the Carolinas, Virginia, &c. Even the power of native habit is incapable of naturalizing a system essentially repugnant to a climate. Accordingly, of all the people of Europe we see the English are least able to resist the effects of tropical climes: and if their descendants the Americans do not alter their old habits in this respect, they will experience the same inconveniencies.

It is so true, that their regimen is one of the grand predisposing causes of disease, and of the yellow fever, that in the height of the epidemics a single case never appeared within the confines of

the prison at Philadelphia : and this evidently because the system of diet there is regulated by a scale of temperature, affording no opportunity for overloading the stomach, and consequently for a depravation of the fluids. The abuse of spirituous iquors in particular is totally banished from this admirable establishment ; an abuse so general in the United States, that drunkenness is a vice as prevalent in them as among the savages.

To suppose, that the manners and tastes of a nation in all these particulars may be speedily and easily changed, is a mistake, into which I shall not fall : I have too well learned to know the automatism of mankind, and the mechanical force of what is called habit : but I think, that a government, were it to take half the pains to enlighten the people, and guide their understanding, that are so frequently employed to mislead them, would obtain a degree of success, of which those who despise them have no conception. If the people be ignorant and foolish, it is because their ignorance and folly are so studiously cherished : and even supposing, that a generation grown old in bad habits would not have sufficient energy to correct them, it would nevertheless be capable, out of affection for it's children, to establish a system of education, calculated to procure them a happiness, of which it felt itself deprived.

I shall conclude this article, which such a wish has tempted me to prolong, by a remark on the cause that excited the yellow fever precisely since the period of 1790. This cause appears to me to be the sudden increase of the maritime cities of the United States, and New York among the rest, owing to the effects of the French war, and the disturbances in the West India islands. The sudden influx of transferable property, monied capitals, and fugitive emigrants, into these cities, gave rise to a number of hasty buildings, and the employment of ground unprepared, which have occasioned a kind of revolution. Trade has diffused among the people wealth before unknown: and the workman, who has gained a dollar and half or two dollars a day; the farmer, who has sold his flower at eight, twelve, or fourteen dollars a barrel, instead of four or five; have indulged themselves in gratifications, of which the favourite and most coveted has been the use of wine and brandy. Thus at the period when the ferments of putridity and inflammation occurred, men's bodies were more disposed to receive the impression, and intemperance, incaution, and dirtiness, produced their constant and customary effects.

Such are the chief characters of the soil and climate of the United States, of which I have traced as accurate a picture, as a model so various in it's

extent, and so subject to local exceptions, will admit. It remains now with the reader, to form his own judgment respecting the advantages and inconveniencies of a country become so celebrated, and destined by it's geographical situation, as well as it's political genius, to act so important a part on the stage of the World. I so much the less pretend to influence the opinion of others in this respect by giving my own, because I have frequently experienced, that on this subject more than any other the tastes of people differ according to the feelings and prejudices of habit. Frequently have I heard opinions totally opposite advanced in companies of travellers in the United States from the various parts of Europe. The Dane and the Englishman find fault with the heat of a climate, that appears moderate to the Spaniard and Venetian: the Polander and the native of Provence complain of humidity, where the Dutchman finds both the air and the soil a little too dry: opinions obviously arising from comparison with the native and accustomed climate of the individual. Still it is true, that all Europeans agree in condemning the extreme variableness of the weather from cold to hot, and from hot to cold: but the Americans, who consider this reproach almost as a personal offence, already defend their climate as their property, and have three powerful motives of partiality to it.

These are individual self-love, common to all men, and national vanity, which is every day growing greater: a habit contracted from the cradle, and become a second nature: and a pecuniary interest as dear to the state as to individuals, that of selling land, and attracting foreign purchasers and foreign capitals.

With such motives it would be difficult to persuade them, that the United States are not the best country in the World: yet if the emigrant, who wishes to settle, collect opinions from state to state, the inhabitant of the southern will deter him from fixing in those of the north by the length of the winter; the hardships of the severe cold; the expenses thence arising for his dwelling, clothes, firing, &c.; the necessity of keeping his cattle in a stable half the year, and consequently of cultivating and laying in a stock of fodder, building barns, &c.; and lastly by the moderate produce of the soil. The inhabitant of the north on the contrary, boasting his health and activity, the effects of the coldness of his climate, the poorness of his land, and the necessity of labour, will decry the southern states for the insalubrity of their marshes and rice-grounds; the torment of their insects, flies and moschettoes; the frequency of their fevers; the intensity of their heat; the indolence and feebleness of constitution thence arising, and producing idle habits, a dissipated life, abuse of

liquors, love of gambling, &c., all of them promoted likewise by the very richness of the soil and abundance of it's produce. At the same time the inhabitant of Carolina will agree with him of Maine in decrying the central states, as liable to the inconveniences of both extremes without enjoying their advantages. Accordingly at Philadelphia I have heard Carolinians complain of heat, and Canadians of cold, because the people there know not how to take proper precautions against either. Lastly, if in a district of acknowledged unhealthiness the emigrant is desirous of precise information, every inhabitant assures him, that the focus of insalubrity is not on his farm, but a neighbour's, and that the fever comes to him from a foreign soil.

The fact is, every individual, every nation, while they complain of their soil and situation, notwithstanding prefer their country, their city, their farm, from self-love, from interest, and above all from a motive less felt, though far more potent, that of habit. The Egyptian prefers his Nile, the Arab his scorching sands, the Tatar his open wilds, the Huron his immense forests, the Hindoo his fertile plains, the Samoiede and Eskimo the barren and frozen shores of their northern seas: neither of them would forsake, would change his native soil, and this solely from the force of that ha-

bit, of which so much is said, but all the magic power of which is never known, till we quit our own circle, to experience the effects of foreign habits.

Habit is a physical and moral atmosphere, which we breathe without perceiving it, and the peculiar and distinguishing qualities of which we cannot know, but by breathing a different air. Accordingly they who possess the greatest understanding, if they would talk of the habits of others without ever having stepped out of their own, that is in fact of sensations they have never experienced, are in reality no more than blind men discoursing of colours. And as backwardness in passing such judgments constitutes that rational spirit, so much decried by the blind and hypocritical under the name of the spirit of philosophy, I shall content myself with saying, that in comparison with the countries I have seen, and without renouncing the prejudices of my own feelings, and native constitution, the climate of Egypt, Syria, France, and all the countries bordering on the Mediterranean, appears to me far superiour in goodness, healthiness, and pleasantness, to that of the United States: that, within the circuit of the United States themselves, had I to make a choice on the Atlantic coast, it would be the point of Rhode Island, or the South-west chain in Virginia between the Rappa-

hannock and the Roanoak ; in the western country, it would be the borders of Lake Erie, a hundred years hence, when they will have ceased to be annoyed with fever ; but at present, on the faith of travellers, it would be those hills of Georgia and Florida, that are not to leeward of any marsh.

APPENDIX*.

THE excessive inundations that took place in Sweden in the summer of 1800, without the rain falling in that country being sufficient to account for them, having led me to suspect, that these floods were owing to the clouds accumulated on the mountains of the frontiers by a prevailing wind, or current of air, I addressed myself for an elucidation of the fact to a zealous friend of the arts and sciences, cit. Bourgoing, the French ambassador at Copenhagen; and I requested him, to procure me exact answers to various questions, which I sent him. He communicated these questions to several learned men, as messrs. Melanderhielm, Swanberg, Loevener, Schoenheuter, Wibbe, Grove, and Bugge; and the separate notes, with which

* See page 167.

they had the politeness to furnish him, having afforded me, by comparing them together, a mass of correlative facts, I deemed it incumbent on me, to send an abstract of them to the minister, by way of thanks. As this abstract is connected with the subject, on which I have been treating in this work, I insert it here with the additional view of drawing the attention of meteorologists to the complete system of the winds of the polar circle, and to attain a knowledge of the corresponding action of the north-west and north-east winds of America with the winds of Russia and Sweden.

Letter to Citizen Bourgoing, Minister of the French Republic to the King of Denmark.

Paris, 1 ventose, 9 (20 feb. 1801).

YOUR obliging notes citizen minister came to me precisely in the inverse order of their dates, and on this account I had to wait for the last, before I could send you all my thanks. I had likewise a wish, to transmit you a summary of the whole, that might exculpate me to you, and to some of those whom you consulted, of having employed your time in systems and theories without foundation, and destitute of utility.

Whatever may be the result of my labours, they will not be useless, if they prove that the currents of air have, or even that they have not, an established course; and whether we can or cannot judge of the wind that prevails in one place, by the wind that prevails or has prevailed in another. Not only the art of navigation, but even agriculture, is interested in the solution of this problem, since it would have considerable effect on the speculations of commerce, and on the purchase or sale of corn. As to the reproach of a spirit of system, I am little affected by it, for I do not feel myself in the least seized with that infatuation, which renders it faulty and ridiculous. At twenty years of age I had systems, of the truth of which I was firmly persuaded. Our masters, you know, citizen minister, taught us not to doubt, to prove every thing with an *atqui* and an *ergo*, and to explain every thing without stopping at a *quia:* but in proportion as experience corrected my education, I saw, that I must renounce the dogmatic spirit; and if I have a single doctrine to follow and inculcate, it is that of doubting much, never being too hasty to assert, and being always ready to reexamine a question and listen to other facts. With this I have not the folly of allowing my adversaries to be more infallible than myself; and whatever their merit may be, if they have not particularly studied the question in debate, if they pretend to decide upon it by reasoning and analogy, I retort upon them in my turn the charge of a spirit of system, and I appeal to a jury of facts; for, to use the expression of S * *, 'I am of the party of facts.' Now what I have to say in the present case is as follows.

From the different notes you have sent me, and among the rest from the short, clear, and methodical statement of Mr. Schoenheuter, bishop of Drontheim, it follows:

1. That Norway is traversed from east to west by a

chain called the Dofrefeldt, or Dofrine hills, which divides it into north and south.

2. That this chain, one of the loftiest in the kingdom, is about 3000 Rhinland feet high [3100 English].

3. That in the system of the air it forms such a positive line of demarcation, that the north and south have scarcely ever the same winds at the same time. If it rain in the country of Aggerhus, Christiansand, &c., it is dry weather in Drontheim, Nordland, &c. Mr. Bugge says the same.

4. The latter case was particularly remarkable in the summer of 1800, when the province of Drontheim north of the Dofrines was deluged with continual rain, so that the harvest was entirely spoiled; while the governments of Aggerhus and Berghen, south of those hills, experienced an excessive drought. In Drontheim from the month of june to the twentieth of august the wind was so permanently north-west, there were scarce twenty days on which it deviated from this point; and the thermometer varying from 6° to 8° of Reaumur [46° to 50° F.], never exceeded 11° [57° F.]. In Aggerhus and Berghen the wind was habitually south, south-east, or even south-west, the quicksilver varying from 14° to 18° [63° to 72° F.]: and there were scarcely seven rainy days, with this remarkable difference, that the meteorological tables of Drontheim and Christiansand, being compared together, exhibit more than twenty instances of it's raining at Drontheim with a north-west wind, while it was fair and dry at Aggerhus with the wind south-east; so that two winds directly opposite prevailed at the same time. Mr. Schoenheuter observes, that Jemteland in Sweden, which is to the east of Drontheim, experienced the same rains, but he does not know whether the wind were the same or not.

In concert with Messrs. Wibbe, Grove, and Bugge, he says, that the prevailing winds on the coast of Norway are

westerly; and that they are the rainy winds there (owing to the ocean), while the north-east, south-east, and east, are the dry winds: that on the north of the Dofrines, the north-west and south-west prevail, and due west and due east are rare: that on the coast of Berghen and in the basin of the Louken, the prevailing winds are the south-west and west, both of them rainy: and that in the basin of the Glomen, and all the gulf of Aggerhus, they are the south-west, which is the chief rainy wind, and the south-east, which is sometimes wet, sometimes dry. Thus far with respect to Norway.

At Stockholm Mr. Swanberg and Mr. Melanderhielm say, that the prevailing winds are west and south-west, which are dry; and that the rainy winds, which are less common, are the east, the north-east, and in summer the south-east: but that Smaland and the peninsula of Scania participate in the climate of the gulf of Aggerhus. They observe, that in the summer of 1800 june and july were very wet at Stockholm; but they have not added any table of the winds (which must have blown from the east). At this time the north-west prevailed at Drontheim, the south and south-east at Aggerhus, and the east in the gulf of Bothnia; so that the Dofrine hills were the point where three opposing currents met.

To explain what passed in the air at this place would carry me too far, I shall therefore content myself with observing: 1. That the inundations in Sweden could not have arisen from the melting of snow, as M*** thinks, for in june and july the winter's snow is all melted: 2. It is evident, that the Dofrine hills, though not forming a chain as compact as a wall, exercised an incontestible influence on the currents of air. If M*** deny this, it will be a theory on his part something more than bold. Though clusters of mountains may not be directly joined to each other, they nevertheless

form an obstacle, particularly if the valleys between them run in different directions, capable of checking the aerial stream, in the same manner as ledges of rocks in the beds of rivers oppose and check the current of the water. But I shall find an opportunity of displaying my theory on this subject more at large.

Accept my thanks for the copy of la Coudraye's Theory of the Winds, which I find to be just what I expected from an intelligent and observing seaman.

ELUCIDATIONS

OF DIFFERENT ARTICLES

MENTIONED IN THE PRECEDING WORK.

I.

On Florida, and the Work of Bernard Romans entitled a Concise Natural and Moral History of East and West Florida, 12mo, *Aitken, New York*, 1776.

THE author, who spent several years in the country as an enlightened observer and physician, distinguishes two climates in Florida; one, which he calls the northern, extending from the latitude of 31° to 27° 40′; the other, the southern, from 27° 40′ to 25°. This distinction he grounds on the circumstance, that in one of them frosts are common during the winter, while in the other they are extremely rare: but it would have been more clear and simple to have said, that it freezes

throughout the parallel of the continent, and does not freeze in the peninsula properly so called*.

In this country the air is pure and clear. No fogs are seen except on St. John's River, but the dews are excessive. The spring and autumn are extraordinarily dry; the autumn very variable from hot to cold. The beginning of winter, that is the month of january, is wet and tempestuous: february and march are dry and clear: from the end of september to the end of june there is not perhaps a finer climate in the World: but july, august, and september are excessively hot; though the variations from cold to hot are much less than in Carolina, and frost far more rare.

In all seasons the Sun at noon is scorching, and the cold never affects even the china orange tree, the fruit of which is here delicious. St. Augustin is on the frontier of the two climates †.

* But this would have been saying something very different: for the latitude of 27° 40′ is about the middle of the peninsula, which extends very nearly to 30° north. T.

† If Romans say this, he contradicts himself, for St. Augustin is in lat. 30° 10′, near the beginning of the peninsula; unless he can be supposed to have made a mistake of two degrees and a half in the latitude, and then Mr. Volney's observation above would be right. I have endeavoured to procure the work of Romans, but without success, therefore cannot clear up this point. T.

On the east or Atlantic side the eastern trade-wind prevails. On the west, or toward the Gulf of Mexico, the seabreezes coming from the west or north-west cool the whole peninsula in summer. All kinds of fruit prosper there, without being dried up by heat or cold. Throughout the whole peninsula the rain announces it's approach four and twenty or eight and forty hours beforehand by an excess or total want of dew. The winds too are less variable, than a little farther north, proceeding toward the continent. During a great part of spring, as well as through the summer and beginning of autumn, and the early part of winter, they are north-easterly; at the close of winter and beginning of spring, they are west and north-west.

The fifteen or twenty days preceding the autumnal equinox, and the two or three months following it, are dreaded in Florida and the adjacent seas; as from the beginning of september to the time of the winter solstice violent storms frequently occur. B. Romans never heard of any serious calamity at the vernal equinox. The dreadful hurricanes of 1769 occurred on the 29th of october and following days: that of 1772 took place on the 30th and 31st of august, and 1st, 2d, and 3d of september. It blew first south-east and east at Mobile; farther west it was

north-north-east. Observe that beyond Pensacola it was not sensible in the east. The wind swelled all the rivers; and, what was very extraordinary, caused the mulberry trees to put out a second crop of leaves and fruit.

The south and south-west winds occasion a thick atmosphere, troublesome to the lungs. They also bring that suffocating air, so much complained of in july and august. The winds from south-east to north-east are wet and cool, and cause frequent showers, that render even the sand fertile. From the east to the north the winds are cool and pleasant; from the north to the north-west they are almost cold. The thermometer is habitually between 84° and 88° of Fahrenheit in the shade, where there is a free circulation of air. During july and august it is at 94°; but in the Sun it quickly rises to 114°. It never falls more than 2° below the freezing point. No one can possibly conceive how delighful the air is from the end of september to the end of june. The east side of the peninsula is hotter than the west, and than all the north climate, the shore of which is exposed to the piercing winds of winter.

The point of Florida, in it's western part, is very subject to squalls and tornadoes from may to august; they come every day from the south-south-west and south-west, but they are quickly

over. (See the map of the winds, where the theory of the aerial currents agrees in placing the eddies precisely at this spot.)

Dr. Mackenzie (not the traveller) has said much of mouldiness, rust, and the deliquescence of salt, sugar, &c. All these, it is true, are seen more at St. Augustin than any where else; yet there is not a healthier place throughout these latitudes. People there enjoy good health, and live to a great age. Persons from the Havannah repair thither as to a Montpellier.

The north climate, that is the west and continental part of Florida, has the same characters as the north part of the peninsula; but it is visited by colder winds. Much has been said of the epidemic of Mobile in 1765: the true cause of it was the excessive intemperance of the soldiers. The English are recommended, even by their physicians, to drink a glass of wine now and then in all these climates: but the misfortune is, they make the glass too large, and the now and then too frequent.

The most dangerous of all the inconveniences, to which America is subject, is neither the heat, nor the wet, nor the cold, it is the terrible and sudden change from one extreme to another, that will make a difference of 30° of the thermometer in twelve hours; and this is worse in the north than in the

south. The soil of Florida is in general a white sand, lying on a bed of white clay. The seacoast is without trees: the interiour is full of firs.

Oldmixon, in his work on the British Empire, is the only person, who has spoken reasonably of the character of the savages. All the Europeans, with their dreams of the loveliness of nature, have said nothing but what is foolish and absurd.

Bernard Romans depicts the savages, p. 38 and following, such as they appeared to me: dirty, drunken, idle, thievish, proud to excess, of a vanity easily wounded, and then cruel, blood-thirsty, implacable in their animosity, barbarous in their vengeance, &c. He represents the Chicasaws as worse than the rest. 'The Chactaws are better; they are honest, and have some idea of private and personal property. They are more laborious than any of the rest. They sell every thing to the traveller; but they are addicted to gaming.' Hence the author infers, that they have a notion of property. 'Suicide is not rare among them, or among the rest. They are as much given to sodomy as the Chicasaws, and the Chicasaws as the Greeks. These honest people would have great need of the missionary Attalla.

'The Chicasaws reckoned in 1771 250 warriors;
'The Chactaws - - 2600;
'The confederate Creeks - 3500.

'All these savages root out the beard with little pincers, or with shells.

'The children kill birds and squirrels at the distance of twenty or thirty yards, with little arrows a foot long, wrapped round with cotton for about four inches at one end, which they blow through a tube eight feet in length.

'The country of the Creeks is the best land, the most pleasing to the eye, and capable of producing any thing.

'That of the Chactaws is very good also; but that of the Chicasaws is a high dry plain, having little water, and of bad quality. It's northern part, as far as the Ohio, is very hilly.'

The author has added three cuts, representing the characteristic features of these three nations; and though they appear to have been executed in wood or pewter, the physiognomy is not badly preserved.

The whole of the book of Bernard Romans is an interesting account of their manners, their customs, and the productions of the soil.

He treats on the diseases of the country intelligently; refutes the assertions of Dr. Lind, as far as they are exaggerated; agrees with respect to the excessive dampness of St. John's and St. Augustin, occasioning mouldiness and rust; yet

observes, that St. Augustin is very healthy, because it has not the marshes of St. John's.

Great and sudden variations from heat to cold, with heavy dews, soon after sunset, occur at St. John's, Nassau river, Mobile, and Campbeltown; but at Pensacola and east of that place, at New Orleans, and on the Missisippi, he did not see or hear any complaint of such. These variations, however, and this dampness, are not comparable to those of Georgia, still less to those of the Carolinas. People guard against them by a fire within doors, and a flannel waistcoat, in the evening. There are no brackish marshes except at St. John's, while Georgia and the Carolinas are infested with them, as well as with moschettoes and stinking exhalations.

Flies and moschettoes abound only in the rice and indigo plantations. It must be confessed, that the Missisippi is covered with them beyond all conception. There is no living without the protection of moschetto curtains. In proportion as the land is cultivated they disappear. In conclusion B. Romans advises persons of full habits, the hard drinkers and gormandizers of Europe, and the plethoric, not to come hither, without changing their regimen entirely.

Fevers are very common from the end of june

to the middle of october, that is precisely after the heavy rains combined with violent heats. They are more obstinate near the rice and indigo plantations. On this subject he enters into very useful details in pages 131 and following.

The fresh and brackish marshes are unhealthy, but those of salt water are not. For the rest, the looks and complexion of the inhabitants are sufficient to denote their diseases.

'The moschettoes are not so abundant on the fresh water, and in the stream of the Missisippi, as lower down the river, and particularly on the seacoast where they are intolerable.' But they are so numerous in the woods along this river from the Ohio, that in the evening, when a fire is kindled, they must be driven away from the man who lights it, or they would make him blind.

The tetanos is a terrible disease in Florida, and it is common to people who drink hard and sleep in the open air.

Lastly the author speaks of the shipwreck of Mr. Viaud and madame Lacouture as a real and absolute fact, which took place on the shore of Apalachicola; but they converted it into a romance. The eggs they found were not turkey's eggs, but those of the tortoise. He men-

tions persons who assisted these two people after their shipwreck.

It is much to be regretted for the sake of science, that this book has not been translated into French.

II.

On the History of New Hampshire, by Jeremiah Belknap, Member of the Philosophical Society of Philadelphia; and the History of Vermont, by Samuel Williams, Member of the Meteorological Society of Germany, and the Philosophical Society of Philadelphia.

§ I.

MR. BELKNAP'S History of New Hampshire, which I have often quoted, and which has not been translated into French, consists of three volumes octavo, printed at Boston. The first and second are occupied with the history of that colony, from it's first settlement: and the picture they exhibit of it is so much the more curious, because we find in it the origin of a number of customs, which, formerly established by coercive laws very strictly executed, have grown into habits, and now compose many parts of the character of the Americans.

We there see the intolerant spirit of the first settlers prescribe rigorous rules to be observed in

the intercourse between persons of the same or of different sexes; the mode of courtship before marriage; the mien and looks to be worn at home and abroad; how to carry the head, the arms, the eyes, to speak, to walk, &c.: whence have arisen that ceremonious tone, that grave and silent air, and all that starched behaviour, which still prevail among the females of the United States. Women were forbidden to expose their arms or neck; the sleeves were to be close down to the wrists, and the gown up to the chin. The men were to cut their hair short, that they might not resemble women: they were not to drink healths, as being an act of pagan libation: and they must not even brew on a saturday, for fear the liquor should *work* on the sunday. Disobedience of any of these injunctions rendered the delinquent liable to have an information laid against him, and the consequence of an information was punishment: thus a real terrorist inquisition prevailed, and men's minds could not but contract all the habits implanted by persecution; habits of silence, of reserve in discourse, of dissimulation, of combination of ideas and plans, of energy in willing, and of resistance when at length patience is exhausted.

As a moral work these two volumes are interesting to consult, from the care taken by the

author to collect authenticated facts; but the number of other particulars would perhaps render a translation tedious to us, who have no concern in them.

It is very different with regard to the third volume, which is a methodical description of the climate, the soil, it's natural and artificial productions, the navigation, trade, agriculture, and state of the country in every respect. This volume may be compared to that of Mr. Jefferson on Virginia: both are as accurate and instructive statistical accounts, as the powers and means of a simple individual are capable of producing. Mr. Jefferson, who published his work in 1782, has the merit of having surmounted the principal difficulties, by tracing the first plan of a performance at that time new. Mr. Belknap, by publishing his in 1792, after twenty-two years of observation, has that of having profited of the facts and method acquired by the progress of the science. His third volume, containing 480 pages in a large type, including the appendix, would be capable of some abridgment, as various particulars are superfluous to us: and though the author pays in it a double tribute to his character as an American and a minister of the Gospel, by declaiming sometimes against philosophers and european

travellers, his work is notwithstanding one of the most philosophically instructive, with which the United States are capable of enriching our language.

§ II.

I shall say the same of the History of Vermont by Mr. S. Williams, which is a single volume 8vo, of about 400 pages, in a smaller type, including also an appendix on different subjects. The work is methodically divided into seventeen chapters. The situation, boundaries, superficies, soil, aspect of the country, mountains, with their heights and direction, caverns, springs, &c., rivers and lakes, climate and seasons, vegetable and animal productions, form the subjects of the first six chapters. The seventh and eighth treat of the savages, of their character, education, and moral and political state. The ninth, tenth, and eleventh contain all the incidents attending the formation of the State of Vermont, and the origin of it's first settlers. The other six, under the title of State of Society, make known, 1, the employment of time in arts and in commerce;

2, manners and customs, comprising education, marriage, civil life, &c.; 3, religion, and the importance of the principle of the perfect equality of modes of worship (the author is a minister of the Gospel); 4, the government of the country; 5, the population; 6, liberty, which he says is much less owing to the American Government, than the condition and situation of the people.

The author may sometimes be thought to enter too much into particulars, explanations, and digressions; but so many useful and instructive facts and observations result from this, that I consider his book as one of those, that have contributed most to diffuse natural knowledge among the people of the United States. I had procured a literal translation of it, as well as of the third volume of Belknap, with an intention to turn it into French * as soon as I had leisure, and pub-

* I make this remark, because the only good method I know consists in translating at first as literally and close to the sense and value of the words as possible. But as it commonly happens in this process, that the expressions and construction of the foreign language supplant those that are proper to our own, this first sketch should be set by, and not taken up again, till you have nearly forgotten the original. Then, on reading over this bad French, the natural forms of style will recur of themselves, and you

lish it: but, not to mention that this labour would be too great for my present state of health, I am informed it is undertaken by a person, who will very soon give it to the World.

may produce an *excellent* performance. Indeed it would be no little matter to make a *good* one, for very few translation deserve this epithet.

III.

Gallipolis, or the French Colony on the Ohio.

A CERTAIN company called the Scioto cannot yet be forgotten at Paris, that in 1790 opened with great parade a sale of lands in the finest district of the United States at five shillings an acre. It's proposals, distributed with profusion, promised every thing that people are accustomed to promise in such cases: 'a climate *healthy* and delightful; scarcely such a thing as frost in winter: a river called by way of eminence the Beautiful River*, abounding in excellent fish of enormous size: magnificent forests of a tree from which sugar flows (the sugar maple), and a shrub that yields candles (myrica cerifera): venison in abundance, without wolves, foxes, lions, or tigers: a single boar and sow in the course of three years will produce three hundred pigs without the least care being taken of them: and in a country like this, there are no taxes to pay, no military enrol-

* This name is given to the Ohio by the Canadians and French geographers. Among other fish catfish are caught in it weighing eighty or ninety pounds.

ments, no quarters to find for soldiers, &c.' It is true, the offerers of so many benefits did not say, that these fine forests were a preliminary obstacle to every sort of cultivation; that the trees must be cut down one by one and burned, and the land cleared with considerable labour and cost; that for a twelvemonth at least every kind of provision must be procured from a distance; that hunting and fishing, which are amusements after a good breakfast, are very severe toils in a savage and desert country. And above all they did not say, that these excellent lands were in the neighbourhood of a species of ferocious animals, worse than wolves or tigers, the men called savages, then at war with the United States.

In short, according to the state of the market in America, these lands were not really worth more than three pence or three pence halfpenny an acre; and no purchaser in the country would have offered more. But in France, but at Paris, then particularly when a kind of contagious enthusiasm and credulity had seized men's minds, the picture was too brilliant, and the inconveniencies too remote, for the bait not to take effect: the counsels and even the example of people possessing wealth, and supposed to be intelligent, added to the persuasion: nothing was talked of in the Parisian circles but the *free* and rural life to be led on the banks of

the Scioto. At length the publication of Mr. Brissot's travels, who just at this time returned from the United States, completely established the common opinion; and purchasers became numerous, chiefly among people of the middle class and the better sort of this class, whose morals are always the best.

Individuals and whole families disposed of their property, and thought they made excellent bargains in buying land at five shillings an acre, because in the neighbourhood of Paris good ground would fetch at least twenty or five and twenty pounds. Every proprietor, furnished with his title-deeds, set off when he thought proper; and in the course of 1791 some embarked at Havre, others at Bordeaux, Nantes, or Rochelle, and the people of Paris, always occupied in business or pleasure, heard no more of the matter.

On my arrival at Philadelphia in october 1795, I made inquiry concerning these people, but I could obtain no satisfactory information. I was merely informed in a vague manner, that the colony was somewhere on the Ohio among the savage lands, and had not prospered. The following summer I directed my course through Virginia, and after having travelled more than three hundred miles from Philadelphia to Blue Ridge near Staunton; after having traversed more than two

hundred miles of a mountainous and nearly desert country from Blue Ridge to the country beyond the Gauley or Great Laurel chain; and then having proceeded in a boat sixty miles down the river Great Kanhaway, still more desert from Elk river to it's opening into the Ohio; I found myself, on the 9th of july, 1796, at the village of Point Pleasant, four miles from Gallipolis. There I received positive information of this City of Frenchmen, for such is the signification of the Greek name they thought proper to give it: and eagerness to see some of my own countrymen, and to hear my native tongue, which I was already forgetting in a country wholly english, made me desirous of repairing thither without delay.

Colonel Lewis, a relation of general Washington, procured me the means: but during my journey, toward the close of day, reflecting that I was going to visit Frenchmen disappointed of their hopes, dissatisfied with their lot, their vanity wounded, and perhaps ashamed of their situation before an *exconstituent*, by whom some of them might even have been foretold it, I felt reasons to check my impatience. Night was commencing when I reached the village of Gallipolis: I could only distinguish two rows of little white houses, built on the flat summit of the bank of the Ohio, which in this place runs at the foot of a perpendi-

cular cliff, fifty feet high. The water being very low, I climbed up to this flat by a steep acclivity formed in the slope; and was conducted to a log-house, bearing the name of an inn. The Frenchmen I found there asked me a few questions, but far less than I expected, and I could perceive the justness of my preceding reflections.

My first business the next day was to visit the place. I was struck with it's wild appearance, and the sallow complexions, thin visages, sickly looks, and uneasy air, of all it's inhabitants. They were not desirous of conversing with me! Their houses, though whitewashed, were nothing but huts made of trunks of trees, plastered with clay, and covered with shingles, consequently damp, and badly sheltered from the weather. The village forms a long square, composed of two rows of houses, built contiguous, no doubt that they might all be burned down at once, if one of those accidents so frequent in the United States should happen. For this glaring fault among a number of others they have to thank the company. A few gardens hedged with thorns, and destitute of trees, but tolerably furnished with vegetables, adjoin the back of the village. Behind these gardens, and beyond some copses, is a large brook, running almost parallel to the river, and rendering the site of the village a peninsula. This brook,

when the waters are low, is full of black mud; and when the Ohio overflows, the water runs up it, and feeds troublesome marshes. On the south-east you have beneath your eye the vast bed of the Ohio: but the hills in front and to the north, and the valleys on the east and west, offer to the view nothing but universal forest. Above the village the clayey soil obstinately retains the water, and forms still more marshes, injurious to the health in the autumnal season. Every year intermitting fevers come on by the end of july, and continue till november.

I found no person in this colony, who had known me before: but as a Frenchman seldom refuses his confidence to one who expresses any friendship for him, I obtained from three or four Parisians, in whose welfare I felt myself interested, the substance of the following information.

'About five hundred settlers, all of them mechanics, artists, or tradesmen in easy circumstances, and of good morals, arrived in the course of 1791 and 1792 in the harbours of New York, Philadelphia, and Baltimore. Each had paid twenty or four and twenty guineas for his passage; and their journey by land, in France and in America together, cost them at least an equal sum. Thus dispersed without any common direction, without any central point of assembling together, they pro-

ceeded with little better than vague information toward Pittsburg and the lower part of the stream of the Ohio, where the land was pointed out. After much time and expense consumed in taking wrong roads, they arrived at a point marked on the map, where the Scioto company caused barracks to be built. Soon after this Scioto company became bankrupt, not making good it's payments toward the Ohio company, the original proprietor and vender, which did not consider itself as bound by the acts of it's debtor, and refused to the French the lands for which they had already paid. Hence a heavy lawsuit followed, which was so much the more vexatious to the settlers, as their money was already exhausted. To add to their misfortune, the United States were at war with the savages, who disputed this part of the country; and who, flushed with their success in dispersing the army of general Sinclair on the Great Miami, on the 4th of november, 1791, blockaded the settlers in Gallipolis during 1792 and 1793, carried off four, and scalped a fifth, who survived this terrible operation.

'Despair seized their minds, the greater number abandoned the undertaking, and dispersed, part removing into the peopled territory, part to Louisiana. At length, after four years of troubles and litigations of every kind, they who remained

obtained from the Ohio company a tract of nine hundred and twelve acres for the farther sum of eleven hundred dollars. For *this favour* they were indebted to the friendship of one of the members of the company, the son of general Putnam, who enhanced it by a service still more important to the community, that of refusing twelve hundred dollars offered by two of the settlers, with the design of getting the whole into their hands, and then making their unfortunate companions pay what they thought proper *.

'Through another instance of good fortune, at the same period, the congress of 1795, moved with a sentiment of equity and compassion, decreed a present of twenty thousand acres to these poor pillaged Frenchmen, to be taken opposite Sandy Creek.' This act is so much the more deserving of respectful gratitude, as those sentiments of ill will toward the government and people of France, that broke out the year following, already prevailed in that assembly. Of these twenty thousand acres four belonged to the person or persons, whose activity promoted the gift, and the rest were to be shared among eighty-two, or eighty-four, who remained of the original number.

* What name should we bestow on the dastardly avarice, that knows not how to acquire wealth but from the miseries of others?

At the time of my visit only a year had elapsed since the conclusion of these arrangements, and industry had already begun to revive, in such a manner as to evince what it would have effected, unchecked by such long and cruel disappointments, and excite our regret, that it had experienced them. Still the life of the settlers was far from pleasant. Each family was obliged to undertake all the arduous labours of a new settlement: hands to work for hire, the utility of which is properly felt only where they are wanting, were not to be procured but at enormous prices. It was hard for people brought up in the ease of a Parisian life, to be obliged to sow, to weed, to reap their wheat, to make it up into sheaves, to carry it home, to cultivate indian corn, oats, tobacco, and squashes, in a heat of 85° or 95°. It is true, the cultivation of every thing, even of cotton, prospered as completely as could be wished. During autumn and winter venison was a halfpenny or three farthings a pound, and bread a penny or twopence; but money was extremely scarce. The sugar maple, tapped in february, afforded some families, who frequented the woods, perhaps a hundred weight of coarse black cassonade, frequently burnt, never free from melasses. In the islands of the river is found a kind of low vine, with a round, red, and tolerably sweet fruit, supposed to have

originated from those planted by the French at Fort Duquesne, and the seeds to have been dropped here by the bears, who are fond of the grapes; but the wine, which they called *mêchant surêne*, differs little from that of the native vines, which grow in the woods to the height of sixty feet, and produce only a black, small, hard, and dry grape. Pigs have been an excellent resource, and these settlers have learned of the Americans to cure their pork so well, that in the course of my journey I ate up a whole ham, which I supposed to have been boiled, but which was in fact raw, and only smoked. Some prefer them in this manner, and with reason: for the lean part, when not oversalted, or when the salt is taken out by watering in due time, is acknowledged to be lighter and less unwholesome in hot countries than beef.

Such is the situation of the colony projected on the Scioto; which is a little remote from the poetic felicity chaunted by the American Farmer, and the delights of the future capital of the Empire of the Ohio prophesied by another writer. If the authors of such romances could hear the panegyrics bestowed on themselves on the spot, they would surely be disgusted with those trite rhetorical talents, that in the present instance have destroyed the comfort of five hundred families.

Throughout the United States I have heard Frenchmen bitterly complaining on this subject. To do justice however, I must confess, that the faults have not all been on one side: for, if it be considered, that many notorious instances should have put men on their guard against being imposed upon; that, while they promised hyperbolical advantages, the authors had not demanded an extravagant credulity, or excluded the precautions of prudence; and if I add, that, in spite of this example, and since my return to Paris, speculators of the same kind are still to be found, who have not wished, nay have even avoided, to have their eyes opened; we must be forced to confess, that there are dupes, who by their infatuation and stupid credulity excite and give birth to the arts of quacks.

I could have wished to leave this colony with a persuasion, that it may grow stronger and prosper: but, beside the radical fault of it's ill chosen situation, it appeared to me, that the discouraging impressions received had still too many motives subsisting, to be susceptible of being effaced; and I have likewise fancied I perceived, during my travels in America, that the French are not so well adapted for establishing farming settlements there, as emigrants from England, Ireland, or Germany. Out of fourteen or fifteen instances of

French farmers, whom I have heard mentioned on the continent, only two or three had any prospect of success: and as to the establishment of bodies of men in villages, such as Gallipolis, all that were heretofore undertaken or formed on the frontiers of Canada or Louisiana, and left to their own resources, have languished, and ultimately come to nothing: while simple individuals from Ireland, Scotland, or Germany, penetrating alone with their wives into the woods, and even to the territory of the savages, have generally succeeded in establishing permanent farms and villages.

In support of my opinion, or rather of the fact, I shall proceed to the instance of the French colony at Fort Vincents on the Wabash, which I visited after Gallipolis: and on this visit I was so much the more disposed to observe with accuracy, as, beside the interest I felt in the general question, it was a matter of particular and personal concern for me, to learn what kind of a retreat the boasted soil of the Missisippi and Upper Louisiana could afford such Frenchmen from Europe, as, enamoured of temperate liberty, might eventually stand in need of an asylum.

IV.

Of the Colony at Fort Vincents on the Wabash, and of the French Colonies on the Missisippi and Lake Erie.

Having gone down the Ohio by Preston, Washington*, Charlestown (in Kentucky), and Cincinnati, the metropolis of the North-western Territory, I arrived at Louisville, about three hundred and fifty miles from Gallipolis. The whole of this space is at present so thinly inhabited, that scarce five villages and eight farms in embryo could be pointed out to me. Louisville is a place in Kentucky of about a hundred houses, two miles above the falls of the Ohio as they are called,

* There are more than sixty different places in the United States, that bear the name of Washington. There are likewise a dozen Charlestowns: and in general the geographical momenclature of this country abounds with repetitions of it's proper names, or of names borrowed from Europe, because every settler, English, Scotch, or Irish, gives to his new abode the name of the place of his nativity: and it may be said, in more respects than one, that the United States are a second edition of England, only in a much larger size. This will be seen better a hundred years hence.

though they are only rapids, which I passed in a boat. I waited there eight hours to form a caravan of four or five horsemen, necessary to traverse a hundred miles or more of woods and savannahs, so completely desert, that you cannot find even a hut to sleep in.

After a forced march of three days, on the 2d of august 1796 we reached the village in Louisiana called Fort Vincent, on the river Wabash. The appearance of the situation is an irregular savannah, about eight miles long and nearly three broad, skirted on all sides by eternal forests, and sprinkled with a few trees, and an abundance of umbelliferous plants three or four feet high. Fields of indian corn, tobacco, wheat, barley, squashes, and even cotton, surround the village, consisting of about fifty houses, the whiteness of which relieve the eye, after the long monotony of wood.

These houses range along the left bank of the Wabash, which is about two hundred yards wide, and at low water is twenty feet beneath the level of the village. Here are no banquettes, as at the Ohio: on the contrary, the bank forms a kind of dike, sloping behind down to the level of the savannah, which is some feet lower. This slope is the effect of the successive inundations of the Wabash. Every house, according to the good Canadian custom, is separate from the rest, and

surrounded by it's court and garden, enclosed with pales. I was delighted with the sight of peach trees loaded with fruit; but saw with regret the odious thorn-apple, that abounds universally in the inhabited places from Gallipolis, and even higher. Adjoining to the village and the river is an enclosure formed by sharp stakes six feet high, and surrounded by a ditch not more than eight feet wide. This is called a fort; and in fact it is a sufficient defence against a surprise from the savages.

I had letters to one of the principal proprietors, by birth a Dutchman, who spoke very good French, and I was entertained at his house for ten days with all the kind offices of simple, frank, and easy hospitality. The day after my arrival there was a sitting of the judges of the district, to which I repaired, to make my observations on the natural and moral state of the inhabitants collectively. As soon as I entered, I was struck at seeing the audience divided into two races of men, totally different in feature and in person. One had fair or light brown hair, ruddy complexions, full faces, and a plumpness of body that announced health and ease: the other very meagre countenances, a sallow, tawny skin, and the whole body as if emaciated with fasting; not to speak of their clothes, which sufficiently denoted their poverty. I presently discovered, that the latter were the

French settlers, who had been about sixty years in the place; while the former were Americans, who cultivated the land they had bought only five or six years before. The French, three or four excepted, knew nothing of English; and almost all the Americans were nearly as ignorant of French; but as I had learned English enough in the course of a year to converse with them, I had the advantage during my stay of hearing the stories of both parties. The following is an extract from my journal.

'The French, lamenting their distress, related to me, that for some years, and particularly since the last war with the savages in 1788, Fortune had seemed to take delight in overwhelming them with losses and hardships. Before that, and since the peace of 1763, when Canada was ceded to England, and Louisiana to Spain, under the protection of the latter power they had enjoyed a degree of happiness of a singular kind. Left almost to themselves, in the midst of deserts, a hundred and fifty miles from the nearest post on the Missisippi, without any taxes to pay, and at peace with the savages, they spent their lives in hunting, fishing, trading in furs, and cultivating a little corn and a few vegetables for their families. Many of them had married daughters of the savages, and these alliances had consolidated their friendship with the surrounding tribes. The place contained as many as three hundred inhabitants.

'During the war that gave America independence, their happy distance from it's theatre long excluded them from a share in it: but about 1782, a Kentucky officer having led against them a small corps, with or without cause, they were plundered, and their cattle, that constituted their chief wealth, killed or driven off.

'The peace of 1783 annexed their colony to the United States, under the government of which they began to recover from their losses. Unfortunately about 1788 hostilities broke out between the Americans and the savages. They had to choose between two friends: but duty and prudence inducing them to prefer the Americans, the savages commenced a war against them, which was so much the more cruel, as it was that of a broken and wounded friendship. Their cattle were killed, the village blockaded, and for several years the inhabitants could scarcely cultivate the ground a musket-shot from their houses.

'Military requisitions were added to their calamities: but in 1792, congress, pitying their fate, gave four hundred acres of land to every one who paid the capitation, and a hundred more to every man who served in the militia. These would have been a fortune to an American family: but to the French, hunters rather than farmers, they were only a transitory gift, which these ignorant and impru-

dent men sold to Americans for less than eight guineas the hundred acres; and even this small sum they were paid in cloths and other goods, on which a profit of twenty or five and twenty per cent was laid. These lands, which were of excellent quality, sold as early as 1796 at two dollars an acre, and I will venture to say, that they are now worth ten. Thus reduced for the most part to their gardens, or the land with which they could not dispense, the French settlers had nothing to live on but their fruit, vegetables, potatoes, indian corn, and once now and then a little game. No wonder therefore they became as lean as Arabs.

'They complained that they were cheated, robbed, and above all, that every dispute or lawsuit being decided by five judges, two of whom were frenchmen, who understood but little of the laws or language, it was impossible for them to maintain their rights. The Americans answered these reproaches by charging them with ignorance, total want of industry, and *savage* indolence. It is very true, that their ignorance in every respect was extreme: there never was a school in the village, till the French revolution drove thither M. l'abbé R., whom I found there a missionary; a polite, well informed, and well educated missionary, and, what is wonderful, *tolerant!* Of nine French people scarcely six could read or write:

while out of a hundred Americans, reckoning both men and women, at least ninety could do both. The language of these people is not a vulgar provincial dialect *(patois)*, as I had been told, but tolerable French, intermixed with many military terms and phrases: all these posts having been originally founded, or in great part inhabited, by soldiers. The regiment of Carignan served as a primitive stock to Canada. I wished to know the period of the foundation of Fort Vincents, and it's early history: but in spite of the authority and credit some learned men ascribe to tradition, I could scarcely obtain any precise accounts of the war of 1757, though some of the old people lived before that period. It is only by conjecture, that I suppose it to have been founded about 1735.'

The American settlers confirmed most of these particulars, only seeing the facts in a different point of view. 'If the Canadians*,' said they, 'be in unpleasant circumstances, they have to blame themselves, or their own government, not us. It is true, they are good, hospitable, and sociable people; but for ignorance and idleness they are little better than savages. They understand nothing of political, civil, or domestic affairs. The

* This is the name given by the Americans to all the French inhabitants of the posts on their western and northern frontiers.

women can neither sew, nor spin, nor make butter; but spend their time in gossipping, and leave their houses dirty and in disorder. The men have no taste for any thing but hunting, fishing, long journies, and a dissipated life. They never make provision like us for the approaching seasons. They know neither how to cure salt or hung pork or venison, make small beer or sour crout, or distil spirits from corn or peaches; all *capital* things for a farmer. If they have any articles for sale, in order to make up for the smallness of quantity they want fifteen or twenty per cent more for them than we, who have abundance: and all their money is spent in buying bawbles, toys, or gewgaws for the indian girls, who are not less coquettish, and far more extravagant than the whites. All their time too is wasted in prating, endless stories of insignificant adventures, and journies to town* to see their friends.

¶ When the peace of 1783 rendered these people citizens of the United States, instead of subjects of the king of Spain, as they were before, their first demand was a *commanding officer*; and it was the most difficult thing possible, to make them

* That is to New Orleans, nearly five hundred leagues down the river. At Fort Vincents they say of a man going to New Orleans, *he is going to town*, as if they lived in one of it's suburbs.

comprehend any thing of a municipal administration, chosen by and from among themselves. Even now they have no persons fit for forming one. They will not learn our language: and it is not our business, who are masters of the country, to learn that of eighty or ninety people, who perhaps will be tired of it to morrow, and go to Louisiana: in which they would be very wise, for with their want of industry they can never rival us.'

From the accounts both of the Americans and Canadians, a similar state of affairs exists in the Illinois settlements and in Upper Louisiana. Discouragement, apathy, and wretchedness equally prevail among the French settlers of Kaskaskias, Cahokias, Rocky Meadows, St. Lewis, &c. The nature of the government in some measure contributed to this: for at first when French, and afterward when Spanish, being purely military, the commanding officer is a real aga or bashaw, who gives, sells, or takes away at pleasure, privileges of importation, exportation, purchase, and monopoly of goods: so that there is no liberty of trade, or enjoyment of property, and to enrich two or three families the rest of the inhabitants are rendered poor and destitute. It is a perfect Turkish government, the sabre excepted; for I must do the present Spaniards the justice to say, that their government is not sanguinary as it was formerly.

On the other hand the manners and customs of the first settlers were one of the original and fundamental causes of their ill success and ruin. Soldiers from principle, or forced to become so by their wars with their neighbours, they were led by the nature of things to prefer a life alternately bustling and dissipated, and indolent and inactive, like that of the savages, to the stable, active, and patient life of the American farmers. Accordingly of late years, when these Americans have found an opportunity of introducing themselves into the Illinois settlements on the left bank of the Missisippi, which belongs to them, their industry has given them such a superiority, that in five or six years they have become the purchasers and possessors of the greater part of the villages. The old settlers, reduced to distress, have sold them their useless possessions for a trifle, as at Fort Vincents; and such was the rapidity with which they were supplanted, that in 1796 almost the whole of the village of Kaskaskias belonged to the single house of E***, and the house V*** possessed elsewhere 60000 acres of excellent land.

On the right bank of the Missisippi, the Spanish government, to render it's lands of value, having adopted the measure of granting them to such Americans as would naturalize themselves, these have supplanted in trade, agriculture, industry,

and activity, the French settlers, who gradually retire before them, and proceed to Canada or Lower Louisiana. Two of my four companions in my Kentucky journey were repairing in this manner to the Missouri, to settle there. They told me, that already more than eight hundred Americans were fixed in the country; and if the lands continued to be disposed of in fief, within three years four or five thousand families would repair thither from Kentucky, where land had grown too dear, and titles to it were always too liable to be contested.

It was my intention to have proceeded with them as far as St. Lewis, 180 miles from Fort Vincents; but various inconveniencies prevented me. I contented myself with noting down facts attested to me by several eyewitnesses, who visited those parts that very year and the four preceding. Acccording to their information, from Fort Vincents to Kas, that is Kaskaskias, the distance is forty-three hours journey*, estimated by Mr. Arrowsmith about a hundred and sixty miles.

* I add a table of the route communicated to me as a thing well known. The reader will remark the little agreement there is between the estimation of leagues and hours; and also the simplicity of the Canadian names, marking the character and manners of the people that gave them.

The country from the Ombra, about seven miles and half from the Fort, is no longer a continuous forest, but a Tatarian meadow, interspersed here and there with little clumps of trees, flat, naked, windy, and cold in winter. In summer it is decked with high strong plants, which so rub against

Route from Poste Vincennes [Fort Vincents] to Kaskaskias.

	French leagues.	Hours
To the brook *Ombra*	3	2
Thence to the Elm in the middle of a meadow	4½	3
Thence to Cat river	4½	3
Thence to the Yoke	5	3
To the Brinespring	2	1½
To the Slave's Gibbet	5	3
To Great Point	5	2½
To the Coffeepot	4	2
To the Yellow Bark	5	3
To Walnut Point (a pretty rivulet)	5	2½
Beyond this rivulet is a beavers dam that has been destroyed: at a cross way you take the left hand road, which is the shortest, but you get no water for five leagues, and rejoin the great road at *Pointe aux Fesses*.		
From Walnut Point to the Dam	1½	1
To the triple-thorned acacia	4	2
To *Pointe aux Fesses*	5	3
To the Meadow of the Hole	5	3
To the Great Rib	5	3
To l'Epronier	4	2
To Kas	6	4
	73½	43½

the rider's legs in the narrow path, through which he must travel, that the journey out and home will wear out a pair of boots. Water is very scarce; and you are liable to lose your way, as one of my companions did three years before, when with two others he wandered about for seventeen days. Thunderstorms, rain, flies, and horseflies, are extremely troublesome in summer. Five years ago you could not cross these meadows without seeing herds of four or five hundred buffaloes; but now there are none. Annoyed by the hunters, and still more by the bells of the American cows, they have gone to the other side of the Missisippi, swimming across the river.

At the farther end of these savannahs, near the Missisippi, is the village of Kas, built in a very hot valley. It is so much gone to decay, that not a dozen Canadian families are left; yet in 1764 colonel Bouquet reckoned four hundred inhabitants. Opposite to it on the other side of the river was formerly St. Geneviève, a pretty large village, noted for it's brinespring: but the inundations of the Missisippi have completely swept it away, and the inhabitants have retired to the high grounds two miles off, where they live in boarded houses, each on his own land. Twelve or thirteen miles above Kas, on the same side of the river, was fort Chartres, built of masonry with extraordinary

magnificence. The formidable river has destroyed this also, and has already attacked one bastion of New Madrid, a settlement formed in 1791 opposite the mouth of the Ohio, and two hundred yards from the Missisippi, which undermines the foot of it in such a manner, that a great part of it will tumble down with the first rains.

This great, this magnificent Missisippi, held out as a Land of Promise by Mr. B***, is a very bad neighbour. Strong in a body of yellowish muddy water, two or three thousand yards in breadth, which it annually rolls over it's banks to the height of five and twenty feet, it urges this mass over a loose earth of sand and clay; forms islands and destroys them; floats along trees, which it afterward overturns; varies it's course through the obstructions it creates for itself; and at length reaches you at distances, where you would have supposed yourself perfectly secure: similar in this to most of the grand agents of Nature, volcanoes, hurricanes, &c.; which are no doubt sublime, but which Prudence counsels us to admire at a distance.

Add to this that it's hot, damp banks are very apt to engender fevers in summer and autumn. Such is the case with the village of Rocky Meadows, where they reckon ten families: and that of Cahokia, or Caho, which has not above forty, instead of fourscore that dwelt there in 1790. Op-

posite Caho, on the right bank, is St. Lewis, or Pancore, a compact city or town of seventy houses, having a handsome but useless stone fort standing on two acres of ground; with only five or six rich families, and five hundred poor, indolent, and aguish white people. The few black slaves there are belong to those five or six families, who use them kindly, the Spanish laws respecting the blacks in Louisiana being the mildest of all European codes. This however did not prevent a rising of the blacks in Lower Louisiana in 1791: and in consequence of this insurrection all the whites in Upper Louisiana being armed and registered, their number was found to be exactly five hundred. Colonel Sargent, secretary general of the North-western Territory, a man of distinguished talents, who in 1790 inspected the settlements on the left bank, called the Illinois, assured me, that the whole of the French families did not exceed a hundred and fifty. The population of all what was called Upper Louisiana, therefore, cannot be estimated at more than seven hundred men capable of bearing arms, or about two thousand five hundred persons.

These accounts, I confess, are very different from what have been lately given at Paris, where this country was represented as one that would speedily become a flourishing empire. But I re-

ceived them from several eyewitnesses, who had *neither places nor interest in speculations in land*, and I publish them impartially, as I have done with respect to Egypt and Syria, without the least desire to hinder any one from going to verify them. I am too well satisfied with my system to change it.

The general decay of the French settlements on the frontiers of Louisiana, and even of Canada *, compared with the equally general increase of the American, was to me a subject of frequent meditation, while I sought to discover the causes of such different events in the same soil and climate. To imagine, as some do, that the French cannot bear this climate well, is a mode of accounting for it I cannot admit: for experience convinced all the officers and physicians of Rochambeau's army, that the constitution of the French could better endure cold, heat, vicissitudes, and fatigue, than those of the Americans. It appears, that our fibre has more elasticity and life than theirs: and the balance is still more inclined in our favour, by the

* At Fort Detroit, for instance, their character is the same as I have just given: and when I was there the september following, most of the French people talked of withdrawing to the territories of king George, rather than mould themselves to the municipal law and laborious plan of the Americans.

faults of their diet, which I have enumerated above, and the abuse of spirituous liquors, to which they are little less addicted than the savages. It was remarked in general Wayne's expedition, and in others, that water-drinkers hold out better than brandy-drinkers: and as to the savages, it is well known that spirits have a more active effect in the extirpation of their race, than war and the smallpox.

On analysing this interesting subject, it has appeared to me, that the true reasons for the difference of the event rest on the difference of the means pursued, and of the employment of time: in other words, on what we call *habit* and *national character*. But the principal causes of this habit and this character are the system of education, and the nature of the government, each more powerful even than physical constitution. A comparison of a few features in the daily life of the settlers of both nations will render the truth of this opinion evident.

The American settler of English or German descent, naturally cold and phlegmatic, sedately forms a plan of managing a farm. He turns his mind, not ardently, but without ceasing, to every thing conducive to it's formation or improvement. If, as some travellers have laid to his charge, he become idle, it is not till he has obtained the ob-

ject of his pursuit, what he considers as a competency.

The Frenchman on the contrary, with his troublesome and restless activity, is led by enthusiasm or some sudden fit, to undertake a project, of which he has calculated neither the expense nor the difficulties. More ingenious perhaps, he rallies the slowness of his German or English rival, which he compares to that of an ox: but the German or the Englishman will answer with his cool good sense, that the patience of the ox is better adapted to the plough than the fire of the mettlesome racer. And in fact it often happens, that the Frenchman, after having undone, corrected, and altered what he had begun, and harrassed his mind with desires and fears, is at length disgusted, and relinquishes the whole.

The American settler, slow and silent, does not rise very early; but when he has once risen, he spends the whole of the day in an uninterrupted series of useful labours. At breakfast he coldly gives his orders to his wife, who receives them with coldnesss and timidity, and obeys them without contradiction. If the weather be fair, he goes out, ploughs, fells trees, makes fences, or the like: if it be wet, he takes an inventory of the contents of his house, barn, and stables, repairs the doors, windows, or locks, drives nails, makes chairs or

tables, and is constantly employed in rendering his habitation secure, convenient, and neat. With these dispositions, sufficient to himself, he will sell his farm, if an opportunity offer, and retire into the woods thirty or forty miles from the frontier, to form a new settlement. There he will spend years in felling trees, making for himself first a hut, then a stable, then a barn; clearing the ground, and sowing it; &c. His wife, patient and serious as himself, will second his endeavours on her part, and they will remain sometimes six months without seeing the face of a stranger: but at the expiration of four or five years they will have acquired an estate, that ensures a subsistence to their family.

The French settler, on the contrary, rises early in the morning, if it be only to talk of it. He consults his wife on what he shall do, and listens to her advice. It would be a miracle if they were always of the same opinion: the wife argues, opposes, disputes: the husband insists upon or yields the point, is irritated or disheartened. Sometimes his house is irksome to him, and he takes his gun, goes a shooting or a journey, or to chat with his neighbours. At other times he stays at home, and spends the time in talking with good humour, or in quarrelling and scolding. Neighbours pay and return visits: for

visiting and talking are so indispensably necessary to a Frenchman from habit, that throughout the whole frontier of Canada and Louisiana there is not one settler of that nation to be found, whose house is not within reach or within sight of some other. In several places, on asking how far off the remotest settler was, I have been answered: 'he is in the desert, with the bears, a league from any house, without having any person with whom he can converse.'

This alone is one of the most distinguishing and characteristic features of the two nations: accordingly the more I have reflected on the subject, the more am I persuaded, that the domestic silence of the Americans is one of the most radical causes of their industry, activity, and success in agriculture, commerce, and the arts; and the same applies to the English, Dutch, and other people of the north, from whom they are descended. In silence they concentrate their ideas, and have leisure to combine them and make accurate calculations of their expenses and returns: they acquire more clearness in their thoughts, and consequently in their expressions: hence there is more decision in their conduct, both public and private, and it is more to the point.

On the contrary, the Frenchman, with his perpetual domestic chattering, evaporates his ideas,

submits them to contradiction, excites around him the tattling of women, backbiting, and quarrels with his neighbours, and finds at length he has squandered away his time, without any benefit to himself or his family. These particulars may be thought of trifling moment, but they constitute the employment of time; and time, as Franklin says, is the material, from which the thread of life is spun. This moral and physical dissipation must have a particular efficacy in rendering the mind superficial; for having several times questioned the frontier Canadians respecting the distances of times and places, or measures of magnitude or capacity, I have found, that in general they had no clear and precise ideas; that they received sensations without reflecting on them; in short, that they knew not how to make any calculation that was ever so little complicated. They would say to me, from this place to that is one or two pipes of tobacco; you can, or you cannot, reach it between sunrise and sunset; or the like. But there is not a single American settler, who does not give with precision the number of miles, or hours, and weights and measures in feet or yards, pounds or gallons; and who does not very readily make a calculation consisting of several actual or contingent elements. Now this kind of practical science has very important and extensive consequences in all the ope-

rations of life; and it may surprise my reader to be informed, that it is much less common among the French, even in Europe, than he would be disposed to imagine.

It may be said, as I have often heard advanced, that the indispensable necessity of conversation or gossipping is an effect of the *vivacity of the blood*, and an expansive gayety of mind and constitution: but if I may judge from my own experience, it is much rather a factitious product of habit and opinion; for going to Turkey as talkative as a Frenchman, after residing there three years I returned as silent as a mohammedan; and during my stay in France I readily resumed by native habits, but I had scarcely lived a few months in the United States, before I acquired anew that American taciturnity, which has again disappeared since my return to Paris. And I have remarked, that the empire of these national habits is so much the more potent, and masters us the more, because it is founded on the prejudices of self love and fashion. Among the Turks and Americans, to talk much is characteristic of the inferiour classes, and a mark of low breeding; while in France, to be silent is an affectation of state and haughtiness; to talk is a mark of wit or politeness; and to let the conversation drop is a sign, that you are deficient in one or the other.

It is owing to a prejudice of this kind likewise, springing from education or opinion, that the French often blame as immoral the readiness, with which an American sells and quits the estate on which he was born, or which he has purchased and improved by his own labours, to go and fix himself in another: for it is not easy to see, what morality there can be in remaining in a place, which you do not find to your wish; but if we trace this idea to it's source, we shall discover, that it has been invented by the rulers, and kept up by the laws, of a people originally in a state of slavery. To bind men to the soil by the prejudices of affection, was at all times the secret or avowed object of an oppressive policy, afraid of losing it's prey. Now as it was for the purpose of breaking their chains both civil and religious, that the Americans emigrated in the first instance, it is not at all surprising, that emigration is become to them an habitual want, and still has in their eyes the charm of being an exertion of their liberty. Be this however as it may, it's effects are and will be much more conducive to the civilization of the World, than the vegetating spirit of sedentary people, who had rather spend their lives at home in idleness and wars, than go and form useful and splendid settlements abroad.

Perhaps this would be no improper place for inquiring into the origin of the habits of talkativeness and taciturnity of the two nations in question; to examine what analogy subsists between a sky naturally foggy and gloomy, and a melancholy and serious temper; whether cold and wet weather incline men to the spleen by some physical action on the nerves and viscera; and on the contrary whether a clear sky and bright sunshine produce gayety by the stimulant effect of the luminous fluid on the nervous, electric like itself. But since the question, treated in all it's points of view, would be rendered complex by a number of different principles: since we must inquire why some southern nations, as the Hindoos, Turks, and Spaniards, are as much given to taciturnity as those of the north: why even in England itself the inhabitants of very bustling cities, such as London, are not less talkative than Frenchmen; why of late we ourselves have ceased to be so, according to the remark of foreigners; why in all countries women are more so than men, and slaves than denizens: in fine, since it would be necessary to analyze what is meant by the word nation; to examine whether every class, every profession, have not it's own moral character, and whether the general political character be any

thing else than that of the ruling class, or of the individuals who govern: I shall content myself with saying, that pretended general principles, hastily laid down by some political writers, are in great measure contradicted by an accurate investigation of facts; and that the climate and constitution, even when they constitute a primary physical cause of the character of a people, are subordinate to a subsequent and secondary cause of still greater energy, the action of laws and governments, which have the power of forcing our actions, of creating new habits contrary to the old, and thus of changing the character of nations, numerous instances of which occur in history.

The subject on which I have been treating in this and the preceding article itself furnishes one: for in studying the manners of the settlers at Gallipolis and Fort Vincents I have found remarkable differences in many respects; and I have clearly perceived, that the French subjects of Lewis XIV and XV, with their feudal and chivalrous sentiments, were far inferiour in industry and ideas of police to that generation, which since the year 1771 has received the impression of so many liberal ideas respecting the organization of society. I have greatly regretted, that the Scioto colony, valuable from the morality and industriousness of

it's members, was not guided in the beginning toward the Wabash or the Missisippi. The addition of it's means to those of the ancient settlers would have formed there a body capable of defending itself from being invaded either by the savages or American landjobbers, and might have formed a rallying point for other provident Frenchmen, desirous of transmitting to their posterity an inheritance of liberty and peace.

V.

General Observations on the Indians or Savages of North America, to which is added a Vocabulary of the Language of the Miamis, a tribe settled on the Wabash.*

MY stay at Fort Vincents gave me an opportunity of observing the savages; whom I found assembled to sell the produce of their *red hunt* †. There were reckoned to be four or five hundred men, women, and children, of various nations or

* The Americans, copying the English, call the savages by the name of Indians, which they pronounce nearly like our *indigènes;* and they had better have kept to this word, for it is absurd to have given the name of the people on the Hindus first to those of Amazonia, and then to those of all America; and this owing to the mistake of one of the earliest Portuguese navigators, who in his voyage to India got so far to the west, that he landed on the coast of Brasil, and to console himself gave it the name of the West Indies.

† The savages give the name of red skins to those of the deer, the season for hunting which is in july and august.

tribes, as the Weeaws, Payouries, Saukies, Pyankishaws, Miamis, &c., all living toward the head of the Wabash. It was the first time of my observing at leisure these people, already become rare on the east of the Alleghanies. Their appearance was to me a new and whimsical sight. Conceive bodies almost naked, embrowned by exposure to the Sun and air, shining with grease and soot; a head uncovered; hair coarse, black, sleek, straight, and smooth; a face disguised with black, blue, and red paint, in round, square, and rhombodial patches; one nostril bored to admit a large ring of silver or copper; earrings with three rows of drops reaching down to the shoulders, and passing through holes that would admit a finger; a little square apron before, and another behind, both fastened by one string or riband; the legs and thighs sometimes naked, at others covered with long cloth spatterdashes *; socks of leather dried in the smoke; on some occasions a shirt with short, wide sleeves, variegated or striped with blue and white, and flowing loose down the thighs; and over this a blanket, or a square piece of cloth, thrown over one shoulder, and tied under the opposite arm, or under the chin. On particular occasions, when they dress for war or for a

* In English *leggings*.

feast, the hair is braided and interwoven with feathers, plants, flowers, and even bones: the warriors wear round their wrists broad rings of copper or silver, resembling our dogs collars, and round the head a diadem formed of silver buckles and trinkets of glass: in their hand they have their pipe, or their knife, or their tomahawk, and the little looking-glass, which every savage uses with more coquetry, to admire so many charms, than the most coquettish belle of Paris. The women, who are a little more covered about the hips, differ from the men likewise in carrying almost continually one or two children on their back in a kind of bag, the ends of which are tied on their forehead. Whoever has seen gypsies may form a very good idea of this luggage.

Such is the outline of the picture, and I exhibit it in the most favourable point of view. For if I were to display the whole, I must add, that from early in the morning both men and women roam about the streets, for no other purpose but to procure themselves rum: and for this they first dispose of the produce of their chase, then of their toys, next of their clothes, and at last they go begging for it, never ceasing to drink, till they are absolutely senseless. Sometimes this gives occasion to ridiculous scenes; they will hold the cup to drink with both hands like apes, then

raise up their heads with bursts of laughter, and gargle themselves with their beloved but fatal liquor, to enjoy the pleasure of tasting it the longer; hand the cup from one to another with noisy invitations; call to one only three steps off as loud as they can bawl; take hold of their wives by the head and pour the rum down their throats with coarse caresses, and all the ridiculous gestures of our vulgar alehouse sots. Sometimes distressing scenes ensue, as the loss of all sense and reason, becoming mad or stupid, or falling down dead drunk in the dust or mud, there to sleep till the next day. I could not go out in a morning without finding them by dozens in the streets or paths about the village, literally wallowing in the dirt with the pigs. It was a very fortunate circumstance if a day passed without a quarrel, or a battle with knives or tomahawks, by which ten men on an average lose their lives yearly. On the 9th of august, at four o'clock in the afternoon, a savage stabbed his wife in four places with a knife within twenty steps of me. A fortnight before a similar circumstance took place, and five such the year preceding. For this vengeance is immediately taken, or dissembled till a proper opportunity offers, by the relations, which produces fresh causes for waylaying and assassination. I at first entertained the design of going

to live a few months among them, to study them as I had done the Bedoween Arabs: but when I had seen these specimens of their domestic manners; and many of the inhabitants of the place, who acted as tavern-keepers to them, and were accustomed to go and trade among them, assured me, that the laws of hospitality did not exist among them as among the Arabs; that they had neither government nor subordination; that the greatest war-chief could not strike or punish a warrior even in the field, and that in the village he was not obeyed by a single child except his own; that in these villages they dwelt singly, in mistrust, jealousy, secret ambushes, and implacable vengeances; in a word, that their society was a state of anarchy, of a ferocious and brutal nature, where want constitutes right, and strength laws; and besides, as they made no provision, a stranger ran the hazard of being starved without any resource; I felt the necessity of relinquishing my design.

My greatest regret was the being unable to acquire any notions of their language, and obtain a vocabulary; a book, of which I have elsewhere *

* See my Lectures on History, delivered as professor at the normal school, and printed separately in 8vo, year 6 [1799], lecture v.

pointed out the importance among people who have no other monuments. The missionary whom I have mentioned, abbé R . . . . , left me no hopes in this respect. He had made attempts, but met with insurmountable obstacles. Though several inhabitants of Fort Vincents understand the language of some tribes, their pronunciation is so defective, and they have so little idea of any rules of grammar, that it was impossible for him to obtain any assistance from them. He convinced me of this in a conference, which a chief of the Weeaws, an old and firm friend of the French wished to have with me. We could never get the Canadian interpreter to translate literally, and word by word.

From all my inquiries on this subject I learned, that the person most capable of fulfilling my wishes, if not the only one, was an American of the name of Wells; who, having been carried off by the savages at the age of thirteen, and adopted by them, had learned several of their dialects, assisted by a good education, in which he had previously made great progress. After the savages had been defeated and subdued by general Wayne, in august 1794, Mr. Wells had liberty to return to his native country. He was at this time acting as interpreter to the general, who was conclud-

ing a definitive treaty at Fort Detroit with more than seven hundred savages united in a grand council.

All this agreed very well with my plan of repairing to Niagara by the way of Lake Erie: accordingly I returned to Louisville, crossed Kentucky, passing through Frankfort it's capital, and Lexington, where in 1782 there was not a single house, and now there were near five hundred, most of them brick, and well built. Thence I repaired to Cincinnati, where, availing myself of a convoy of money going to Fort Detroit, through the civility of major Swan, I could conveniently pursue the military road, just traced by general Wayne's army across a forest of two hundred and fifty miles, throughout which we found no accommodation but five palisadoed forts lately constructed. The reception given me by the general afforded me room to believe, that I had attained my object beyond my hopes; but the tribute I paid to the fevers of the country and season robbed me of all my advantages.

I was obliged to avail myself of the only vessel, that would pass the lake before the winter, and return to Philadelphia. Capricious fortune awaited me there, to gratify me in this point at less expense: she brought thither the following winter, 1797, Mr. Wells, who accompanied a Miami

war-chief, celebrated among the savages under the name of Mishikinakwa, and among the Americans under that of the Little Tortoise, which is a translation of it. He was one of those that contributed most to the defeat of general Sinclair in 1791; and if his plan of not fighting general Wayne, but intercepting his convoys, had been pursued, this army would have been cut off likewise, as I have been informed by officers of distinguished rank and merit. After having been a formidable enemy to the United States, the Little Tortoise, convinced that resistance must ultimately prove vain, had the good sense to persuade his tribe to a reasonable capitulation. A more remarkable degree of understanding led him to feel the necessity of bringing his tribe to live on the produce of agriculture, instead of hunting and fishing, by which the savages procure their subsistence. It was with this view he came to Philadelphia, to solicit congress and the benevolent society of friends *, to furnish him with

* Vulgarly called *quakers;* a society, which has perhaps been spoken of too well in Europe, and too ill in the United States (on account of the Negroes); but which, every thing maturely considered, appears to me that religious sect, the morals of which, both theoretical and practical, are most favourable to the improvement of society, and of the condition of mankind in general. It may be said, that every useful charitable institution, and every good

means of carrying this laudable endeavour into execution. He had been inoculated for the small-pox after his arrival; and, labouring under the gout and rheumatism, was having recourse to medicine for assistance, which government was eager to procure for him.

This incident furnished me with a more fortunate opportunity, than I could have expected, not only affording me an interpreter to communicate my ideas, but the mouth of a native to give me the sounds in all their purity. I obtained an introduction therefore to Mr. Wells and the savage chief: I explained to them my design and it's motives; and having obtained their assent, I employed nine or ten visits, in january and february 1798, in drawing up the vocabulary annexed. This was the basis of my labour: but in the course of conversation many curious remarks occurred, which I preserved with the more care, because the facts, coming without preparation, were the less to be suspected of alteration, and the habit of seeing me, added to my being a frenchman, diminished in the Little Tortoise that spirit of suspicion and distrust,

regulation of police in Pennsylvania, is it's work; and to introduce into it's scheme of education more natural knowledge is all that it wants, to render it deserving of being the *church* of every rational man. How can a devout person call the study of the works of God profane?

which sway the savages in all their discourse. Every day after my visit I wrote down what appeared to me most interesting; and these observations, united with those I collected during my travels from the most judicious witnesses, form the materials of what I have here reduced to order.

It is not my design, as it is not in my power, to treat of the savages in general: such a plan would be too extensive, as there exists a very great difference in the kind of life, habits, and manners of the savages of various climates, of hot countries and cold, open and woodland, barren and fertile, parched with drought and drenched with water. I confine myself solely to the savages of North America, with an intention to furnish this question obscured by paradoxes the contingent of my testimony concerning what I have seen, or known to be most certain and best supported by facts. I presume too, that the reader is not wholly unacquainted with the subject, but that he has read the narratives of those travellers, who have visited and described these countries within the last forty years*.

* As Captain Carver, of whose travels in 1768 we have a good translation, 1 vol. 8vo, 1784. The author appears to have been a little credulous, and very vain; but, notwithstanding his partiality for the savages, who flattered his vanity, rectitude and sincerity are visible in his accounts. The

Our first conversation began with information respecting the climate and soil of the Miamis. Mr. Wells informed us, that this tribe dwelt on the

confessions he makes of his want of learning and incapacity of drawing up an Indian grammar and dictionary, lead me to suspect, that he was not the compiler of his own work; and I imagine, that this service was rendered him by the editor, as was the case with a well known traveller of our nation.

Another traveller is John Long, an Englishman, who was a clerk or factor for twenty years in the fur trade in Canada. He published his travels in 4to in 1791, and they were translated into French, and published in 8vo, in 1793. It is to be regretted, that the translator has taken the liberty of suppressing the vocabularies, to save something to the bookseller. This work deserves to be reprinted with corrections, for it exhibits the most faithful picture I know of the life and manners of the savages, and of the Canadian traders.

A third is Bernard Romans, of whom I have already said enough.

A fourth is Umfreville, whom I have made known to the public.

I say nothing of Adair's book on the Creeks and Cherokees, because with a few real facts he has intermixed a number of misrepresentations or falsehoods, with a design to prove, that the savages are descended from the Jews. This extravagant idea, which however he entertains in common with several missionaries, has only led him to see every thing belonging to the savages in a false light: without sound notions of the nature of the human intellect, it's progress, and all the principles that sway and modify the man of nature, the history of nations cannot be well studied and pursued.

northern branches of the Wabash: that it's language is spoken among all the tribes along the river nearly to lake Michigan, as the Weeaws, Payouries, Pyankishaws, Putewoatamies, Kaskaskias, and Long Isle Indians: that it has a great affinity with the languages of the Chipeways, Ottawas, and Shawanese, which differ only as dialects, but it is altogether distinct from that of the Delawares: the nasal sound is frequent in the Miami, and I imagined at first I was hearing the Turkish. Mr. Wells added, that their country was part woodland, part savannahs, and sensibly colder than Fort Vincents. Having quitted this place after a complete thaw, he had found again the same snow a hundred and thirty miles farther north, without having observed any mountainous elevation of the ground. The air at Philadelphia seemed to him less piercing. The predominant winds in the Miami country are nearly the same as on the Atlantic coast; in winter the north-west, strong and cutting, with clear weather; in summer, this wind is rare and mild, and the south-west prevails, hot, cloudy, and sometimes stormy. The south is the grand rainy wind; the north is the chief snowy wind in winter, but in summer fair and mild. The south-east is rare; the north still more so. The soil is fertile; the indian corn finer, and game more abundant, than in any part of

the Atlantic coast. In consequence the natives, particularly the Putewoatamies, are a fine stout race of people. (I can say the same of the Shawanese of fort Miami, at the stature of whose women I was astonished, though by no means at their beauty.)

During the time I was making my observations on the Little Tortoise, who, not understanding English, took no part in the conversation. He walked about, plucking out the hairs of his beard, and even of his eyebrows. His dress was in the American fashion, a blue suit, with pantaloons, and a round hat. I desired Mr. Wells to ask him how he felt in garments so different from his own. 'At first,' said he, 'they seemed to confine my limbs; then I got used to them; and as they are a defence against the heat and the cold, I now like them.' He had tucked up his sleeves, and I was struck with the whiteness of his skin between the wrist and the elbow. I compared it with my own, and found no difference. The Sun had tanned the back of my hands as much as that of his, and each of us appeared to have on a pair of gloves. I found his skin very soft to the touch, and in all respects like that of a Parisian. We had then a long conversation respecting the colour of the savages; that which is called a copper colour, asserted to be innate like the black of the Africans

and held to constitute the natives of America a distinct race.

The facts resulting from this discussion were, 'that the savages distinguish themselves by the name of *red men:* that they prize their own colour, with reason, above white: that however they are born as white as we*, and in their infancy continue so†, till their skin is changed by the Sun, and by the grease and juices of herbs, with which they besmear it: that in the women those parts of the waist, hips, and thighs, which are constantly covered, always remain white: in short, it is fundamentally false, that this copper colour, as it is called, is innate, or the same in all the natives of North America; on the contrary it varies in different nations, and is one of their means of distinguishing each other.'

I observed, that Mr. Wells, who had lived fifteen years among them, and in their manner, had their complexion, not that of an American: and as to the real shade of the colour, it appeared to me that of soot, or of a ham, smoke dried, cleaned, and shining, exactly resembling that of our peasants on the Loire, or Lower Poitou, who live like the savages in a hot climate and a little marshy,

* So is the negro, but he grows black within four and twenty hours.

† Oldmixon says the same, vol. i, p. 286.

or that of the Spaniards of Andalusia. On this remark, which I communicated to him, the Little Tortoise said: 'I have seen Spaniards in Louisiana, and found no difference of colour between them and me. And why should there be any? in them, as in us, it is the work of the *father of colours*, the Sun, that burns us. You whites yourselves compare the skin of your faces with that of your bodies.' This brought to my remembrance, that on my return from Turkey, when I quitted the turban, half my forehead above the eyebrows was almost like bronze, while the other half next the hair was as white as paper. If, as natural philosophy demonstrates, there be no colour but what originates from light, it is evident, that the different complexions of people are owing entirely to the various modifications of this fluid with othe elements, that act on our skin, and even compose it's substance. Soon or late it will be proved, that the blackness of the Africans has no other source*.

* Every day fresh facts, in appearance fantastic, occur to furnish new helps towards solving the problem. One of the most remarkable is the case of Henry Moss, a negro in Virginia, a descendant in the third generation from ancestors born in Congo, who in the course of six or seven years has become a white, with long, sleek, brown hair, like a Eu-

The features of the Little Tortoise struck me by their resemblance to those of five Chinese Tatars, who had come to Philadelphia in the suite of the Dutch ambassador van Braam. This likeness of the Tatars to the savages of North America has struck all those, who have seen both; but perhaps they have been too hasty in their inference, that the North Americans came originally from Asia. As the savages have some ideas of geography, I communicated to the Little Tortoise our hypothesis on this subject; and that he might understand them the better, I laid before him a map comprising the eastern part of Asia and the north-west of America. He very readily recognized the lakes of Canada, Michegan, Superiour, the rivers Ohio, Wabash, Missisippi, &c.; the rest he examined with a curiosity, that convinced me it was new to him: but it is the art of a savage, never to display any marks of surprise. When I explained to him the means of communication by Behring's Strait and the Aleutian isles: 'why,' said he, 'should not these Tatars, who resemble us, have come from America? are there any proofs to the contrary? or rather, why should we

ropean. He is the person of whom Liancourt speaks, vol. v, p. 124. I have seen an authentic certificate of the transmutation of his skin.

not both have been born in our own country?' In fact they give themselves an epithet, that signifies *born of the soil (Metoktheniakē)*. 'I see no objection,' answered I, 'but our *black gowns** will not allow it. There is only the difficulty of conceiving, how any particular races originated.' 'It seems to me,' replied he, 'that this is as difficult to the *black gowns* as to ourselves.'

I have said, that the savages of America resemble the Tatars; but accuracy requires us, to make some exceptions: for the Eskimoes, who dwell in the north, on the borders of the Frozen Ocean, are not Tatars; and the gray eyed men, who people the archipelago of Nootka Sound and all the adjacent shores, are equally a distinct race. The Tatar character belongs to those who inhabit the rest of the continent, and who constitute the vast majority; and here too I set aside the Calmucks, for the savages have not their flat face and depressed nose. In general the lower part of their face is triangular, the upper nearly square; the forehead well shaped; the eyes very black, deep set, lively, and rather small than large; the cheeks a little prominent: the nose straight; the lips rather thin than thick; the hair jet black, smooth, flat, without any instance of a light colour; their

* This is the name they give the missionaries.

look suspicious, and disclosing ferocity at the bottom of the heart. Such is their general physiognomy, but modified according to the tribe or the individual. At Fort Vincents and at Detroit I noticed many of their countenances, which reminded me of those of Egyptian fellahs, and even of several Bedoweens: beside the colour of the skin, the quality of the hair, and many other resemblance, they have this in common, the mouth is formed like a shark's, that is, the sides are lower than the front, and the teeth, small, white, and regular, are sharp and cutting like those of the cat or the tiger*. May not this form be naturally accounted for from their biting from a large piece when they eat, without ever using a knife? This habit evidently gives the muscles a position, which at length they retain, and this position ultimately modifies the solid parts likewise. Taking up this idea, the resemblance of features between very remote people, particularly savages, is not so certain a proof of parentage or relationship, as it is made; for analogous influences of climate, soil, food, habits, and in short way of life in general, may very well be the cause of a resemblace in shape and fea-

* Children in consequence cut them easily, and never suffer from dentition.

ture. I say nothing of their women, because their features did not appear to me at all different. Neither do I pretend to deny, that there may be pretty ones among them, as some travellers assert. A dish, that would appear insipid at another time, may be thought very palatable after a long journey. I shall likewise say very little of the custom the Chactaws have of giving the sculls of their newborn infants the figure of a truncated pyramid, by compressing their heads, while yet soft, in a mould made of little boards. This whimsical practice is so effectual, that the whole nation is known by the shape of the head, and has received the name of Flat Heads.

Some writers, even of merit, have asserted, that all the savages resemble each other so strongly, that they are scarcely to be distinguished from one another. Surely these writers would say too, that every Negro, and every sheep, is alike: but this would only prove, that they had not examined them so closely as the shepherd and the slave-dealer. 'We can distinguish every nation,' said the Little Tortoise to me, 'at first sight: the face, the complexion, the shape, the knees, the legs, the feet, are to us certain marks of distinction: by the print of the foot we can distinguish not only men, women, and children, but also tribes. You whites are conspicuous by turning out your toes: we carry

them straight before us, that they may encounter fewer obstacles among the bushes. Some people turn them a little inward, have the foot broader or shorter, tread more on the heel or on the toe, &c.'

The mistaken notion, that the savages have no beard, has undoubtedly been rendered current in the World by the same writers, or others like them: but it's absence arises from the particular, constant, and almost superstitious care, with which they eradicate it, and depilate the whole body. This is testified unanimously by all who have closely observed them, as Bernard Romans, Carver, John Long, Umfreville, &c. Oldmixon, the author of the British Empire, who wrote in 1707 from the best authorities, says, 'the Indians have no beard, because they use certain receipts to extirpate it, which they will not communicate.' Vol. I, p. 286. Experience has made known, that these receipts were little shells, which they used as tweezers: since they have become acquainted with metals, they have invented an instrument, consisting of a piece of brass wire rolled on a round piece of wood the size of the finger, so as to form a spiral spring; this grasps the hairs within it's turns, and pulls out several at once.

It is inconceivable how baron Lahontan among us, and lord Kames among the English, could have denied or been ignorant of such a fact: but

it is very natural, that the paradoxical Dr. Pauw should have laid hold of this anomaly, to support the edifice of his reveries. The Little Tortoise and Mr. Wells left me no doubt on this subject; the former was incessantly amusing himself with pulling out the hairs even of his eyebrows, as the Turks are with curling their whiskers. No wonder if this practice, continued for several generations, should enfeeble the roots of the beard. As to hair on the body, I myself have seen several savages with it surprisingly long and straight under the armpits. Is this because it grows more freely from being exposed to the air? and did the practice of eradicating the beard originate from the design of depriving the enemy of such a dangerous hold on the face? This seems to me probable.

The figure of the savages is justly spoken of with praise: in general they are plump and well made; they who live in a fertile and well watered country, like that near the Wabash, are taller and stouter than those, whose lands are of a bad quality, as all who dwell beyond the latitude of 45° north; these being more slender, and of shorter stature. But if we never see among them a person lame in hand or foot, humpbacked, or blind, we should consider, before we thence draw an inference too much in favour of their way of life, that every weakly child must necessarily die of fatigue at an

early age. Indeed it sometimes happens, that parents expose or destroy a deformed child, that must become a burden to them. Thus we find the savages practising a law, which Lycurgus gave the Spartans; not that it has descended or been communicated to them, but similarity of circumstances gave rise to it in both instances; for in a nation that is poor, weak, and always at war, there is no superfluity to support useless mouths. It is in consequence of this poverty, that among many savages, particularly on the north of Lake Superior, when old people become a burden to the community, 'they are sent to live in the other climate;' in plain terms they are killed, as was the practice among the savages of Scythia and near the Caspian Sea, according to the account of Herodotus. And, as a proof of the wretchedness of the savage life, it is commonly the aged person himself, who desires an end to be put to his existence. If a savage lose a limb in war or by disease, he is undone. How could a cripple resist an enemy with all his limbs perfect? how could he hunt, fish, or procure any kind of subsistence, with which no one will supply him? For among them no one has or can have any store in reserve, and every one is reduced to his own casual and variable acquisitions. For the same reason we see neither ruptures nor chronic diseases among them. Wild

Nature, that surrounds them, seems to say, 'be strong or die:' yet in her severity she does not even leave them a free choice, for she frequently renders their difficulties greater than their strength.

The robust health of the savages has likewise been vaunted. No doubt their habitual exposure to all weathers imparts a vigour to their constitutions, that cannot be expected in the effeminacy of a city life: but to estimate justly their advantages in this respect, it must be observed, that their way of life subjects them to irregularities and excesses incompatible with constant health, and with a truly robust constitution. Hating the sedentary and confined occupation of a farmer; preferring the wandering and casual life of a hunter and fisherman; they can have no stores, or durable provision, and are consequently exposed to severe alternatives of famine and satiety. When game abounds, and they can hunt without fear of surprise, it is a time of enjoyment and gluttony: but when game fails several days following, as is the case every winter, or they dare not roam about for fear of an enemy, they are frequently reduced like the wolves to live on the bark of trees or bulbous roots. They have bethought themselves, though I believe but lately, of drying flesh, and reducing it to a very fine powder; but their provision of this kind is never capable of lasting through a whole season. If after

long fasting they meet with any prey, as a deer, a bear, a wild ox, they fall on it like vultures, and do not leave pulling the carcase to pieces and devouring it, till they drop down gorged to the throat. This practice renders them intractable guides on any regular journey. The quantity swallowed by them on such occasions would be incredible, were it not placed beyond the shadow of a doubt by numerous authentic witnesses. It is notorious on all the frontiers, that two famished savages will easily pick the bones of a deer at one meal, without being satisfied. This reminds us of the heroes of the Trojan war, who would eat up a whole lamb or half a calf; and this demonstrates, that those heroes were no more than savages living in similar circumstances.

But such excesses cannot fail of disordering the health: and it is now confirmed, that the savages are liable to complaints of the stomach, bilious and intermitting fevers, consumption, and pleurisy. Fractures and dislocations are not uncommon among them, but they reduce them tolerably well. From rheumatism they would suffer more, did they not practice fumigation by means of red hot pebbles. The ravages made among them by the smallpox are well known; and no doubt they are occasioned by the obstacle, that a hardened skin opposes to the eruption. Mr. Jefferson will bestow

on them an immense benefit, by teaching them the practise of vaccination, as we learn from the newspapers. Within these few years the quaker and moravian missionaries, who have succeeded the jesuits, inform us, that the tribes converted by them have become more robust, carry heavier burdens, and are less liable to diseases; and they have very justly observed, that this is owing to a more regular regimen, and less inequality in the quantity of food, to which they have brought them. Another fact equally notorious is, that every European, who has embraced the savage life, has become stronger, and better endured every excess, than the savages themselves. The superiority of the people of Virginia and Kentucky over them has been confirmed, not only in troop opposed to troop, but man to man, in all their wars. I shall not adduce in proof of their weakness the beating of their pulse, which Dr. Rush asserts to be slower: for at the same time, and in the same individuals, Dr. Barton could perceive nothing like it, and the pulse of the Little Tortoise appeared to me altogether like my own. Neither shall I mention the feebleness of their passion for the sex, as it is owing to a very different cause. The savage is continent, and almost chaste, from principle and the necessity of self-preservation: the least diminution of his strength by de-

bauchery might cost him his life the next day by rendering him less able to resist an attack from his fellow men, or from the hand of Nature.

When talking of the inconveniences of the savage life, I asked Mr. Wells whether it were true, that many whites adopted it from choice, and why they preferred it to what we call civilized life. His answer, which was long and minute, agreed with all I had heard from men of sense and experience in Kentucky, at Fort St. Vincents, and at Detroit. The unanimous result of the facts is, 'that the Canadians, that is to say men of French descent, furnish more of these than the Americans, or men of English and German blood. The latter have a natural antipathy to the savages, which is increased by their cruelty toward their prisoners. The Americans have a repugnance to the savage women, the Canadians the contrary. Yet an inclination for the savage life is less common among men grown, than among youths under eighteen. Of the Americans those only become attached to it, who have been carried off prisoners at an early age; because the excessive liberty it allows children in running, playing, and amusing themselves, is much more pleasing to them than the confinement of schools, and the punishment there inflicted on their idleness. To have nothing to do

but play, is the delight of an infant: it requires years, to make him contract habits of labour and study; a few days are sufficient, to give him those of idleness and independance. These are inclinations natural to man, and to which he mechanically reverts. As to adults, particularly Americans, taken and adopted by the savages, scarcely any one can accustom himself to their way of life: I myself,' said Mr. Wells, 'though carried off at the age of thirteen,' (he appeared to me to be about two and thirty), 'then adopted, and well treated, was never able to forget the social pleasures I had already tasted.

'As to those who voluntarily join the savages, and for the most part are Canadians, they are generally men of bad character, libertines, idle, of passionate tempers, or of little understanding. The kind of influence they acquire among the savages flatters their vanity, while the licentious life they lead with the squaws indulges the prevailing passion of their headstrong youth; but when they grow old, being reduced to extreme wretchedness, they scarcely ever fail to return to their country, regretting their rambles when too late.

'Among us,' says Mr. Wells, 'a man who has ever so little industry, may procure himself a comfortable subsistence for the present; and provide for the future those conveniences, the value

of which is felt in old age. You establish a farm, you bring up children, who, when you are worn out with old age, will gently close your eyes. In the savage state, on the contrary, your enjoyments are confined to drinking, eating, which is not always in your power, and hunting. The whole career of ambition is reduced to that of being a great warrior, celebrated among five or six hundred men. Old age comes on, your strength fails, your consequence declines, and your days close with infirmity, contempt, extreme misery, and the necessity or the want of some hand to put an end to your existence. The Indian can never employ another in his service: with him, to serve and obey, even voluntarily, is a kind of disgrace reserved for the women. A great warrior must do nothing but hunt and fight. Women have all the burden of household affairs, of husbandry, if any be practised, and on a journey of carrying the children and utensils. They are literally beasts of burden. They do not even inherit the property of their husbands. Were the Little Tortoise to return home to morrow and die, all the presents he has received, clothes, hats, trinkets, would be distributed, nay almost plundered, and nothing go to his children. It is the custom of his tribe, which is common to many others: while living they enjoy the property of their movables, arms,

and trinkets; but as at their death not so much as their knives, or even pipes, descend to their children, they may be said to be only usufructuaries. Still less have they any idea of immovable property in lands or houses. Accordingly all the ambition of a savage is confined within a small circle of wants, calculated rather to support than enlarge his existence.

'This existence, incessantly in danger, itself centres in the present moment. The possibility of perishing every instant is the most constant and radical thought, that occupies the mind of a savage. He uses life as a vessel hourly liable to be broken by the number of accidents to which it is exposed. This idea, having become familiar to him from infancy, is not affected: it is necessity, to which he resigns himself, or which he braves. But a natural consequence of this is, that he is attached to nothing in the World but his arms, or perhaps a companion and friend, who is to him an additional mean of defence and preservation. He caresses his children, as any animal caresses it's young. When he has dandled them and kissed them, he leaves them, to go to war or the chace, without thinking of them any more; he exposes himself to danger, without caring what becomes of them: they will struggle against fate, against nature; they will die young or old, no matter, since death must

be their lot. Thus too suicide is not unfrequent among them: they kill themselves through disgust of life, through disappointment sometimes in love, through rage at some great affront, which they are unable to revenge. They live wholly in their feelings, little in remembrance, not at all in hope. If they be in health, they gambol, dance, and sing: if they be ill, or weary, they lie down, smoke, and sleep; but as frequently neither rest nor food is at their own disposal, it is difficult to perceive in this either liberty or happiness.'

Such was the substance of our conversation this day, which struck me the more, as it was the result of twelve or fifteen years experience. I was desirous on the other side of learning the motives, by which the savages are prevented from settling among the whites, and which on several occasions had induced those, who had been educated among them, to prefer resuming their native habits. On this occasion time and opportunity were wanting; but a few days afterward I was more fortunate, and it was the Little Tortoise himself, who explained to me the reasons.

Some quakers had come to pay him a visit, and, among various offers of service, they had proposed to him, to remain as long as he chose, even his whole life, with an assurance, that he should want for nothing. When they were gone, I said to the

Little Tortoise by our common interpreter: 'You know the manners of those people, they are backward and moderate in making offers, but when they do make any, you may safely depend on them. What prevents you from remaining among the whites? Are you not more comfortable here, than on the banks of the Wabash?'

He was slow in giving me an answer, agreeably to the cold and reserved manner of the savages: but when he had meditated a little, walking about in the mean time, and plucking out his hairs, he replied: 'Yes, I have pretty well accustomed myself to all I find here. These clothes are warm and good in my opinion: these houses are excellent defenses against the rain, wind, and Sun; and in them we find at hand every thing that is convenient: this market' (that of Second street was under the windows) 'furnishes every thing that can be desired, so that there is no occasion to hunt for venison in the woods. Taking all things together you have the advantage over us; but here I am deaf and dumb. I do not talk your language; I can neither hear, nor make myself heard.—When I walk through the streets, I see every person in his shop employed about something: one makes shoes, another hats, a third sells cloth, and every one lives by his labour. I say to myself, which of all these things can you do? Not one. I can make a bow or

an arrow, catch fish, kill game, and go to war: but none of these is of any use here. To learn what is done here would require a long time, be difficult, and the success uncertain. Old age comes on: if I were to remain with the whites, I should be a piece of furniture useless to my own nation, useless to the whites, and useless to myself. What is to be done with a useless piece of furniture? I must return to my own country.'

These few words, properly considered, contain the solution of the problem. To every removal to a foreign country the language is a primary obstacle; for a residence in a country where you cannot converse with the people is insupportable, and to learn their language is a long and laborious exertion of the mind. A considerable time after you can speak it, to express yourself correctly and at will is another difficulty felt every moment, and every moment disheartening you. This obstacle surmounted, and it never is well except by young persons, three other powerful ones remain: 1st, the impression of the early habits of infancy, the effect of which is such, as after many observations, to render it to me indubitable, that the moral system of a man has assumed at the age of five years that bent and direction, which it will retain throughout his whole life. It is unfolded according to circumstances, but nothing new in

the character is produced, every thing proceeds from the same source. 2dly, the absence of friends and relations, an intercourse with whom is a physical and moral tie. 3dly, that scaffolding of pains and labours, which our social state would require from a savage, without reckoning upon the physical difficulty of submitting to the confined and fettered life of our cities, renouncing his careless and wandering habits.

These men are actually in the state of wild animals and birds, that are never tamed when caught after they are at years of maturity. The missionaries have been fully sensible of this truth, and they all agree, that these savages can never be civilized but by beginning their education with infancy, even from their birth, and taking them as it were from the nest, like the little birds we term unfledged. This passion for independence, that is for idleness and doing nothing, is so natural, that the following observation has been made in the United States. Among the mechanics who emigrate from Europe, all who have not sufficient capacity to acquire comfortable settlements in the towns, hasten, as soon as they have gained a little money, to buy land up the country, where it may be had for half a dollar, or a quarter of a dollar an acre, to settle as proprietors and be their own masters: and as they soon find

it a toilsome life to be felling the trees, they intermingle with it the occupations of shooting and fishing, in other words they become half savages. But what is the price they pay for this savage liberty? We have had a few specimens, let us proceed to examine the particulars more at large.

'The Little Tortoise,' said Mr. Wells to me, 'has every reason to think as he does: if he delayed returning home, he would lose his credit among his countrymen. Already it requires great management for him to preserve it. When he gets home, he must at once resume the Indian dress and habits, and not speak too favourably of ours, lest he should wound their pride, which is extreme. In those villages the jealousy of every warrior, of every savage, renders the situation of the chiefs as delicate as that of the head of a party in the most democratic state: theirs in fact is an extreme and terrible democracy. This man has at home good clothes, tea, and coffee: he has even a cow, and his wife makes butter: yet he is careful not to indulge himself in the use of these, but to reserve them for white strangers. When he first had a cow, she was maliciously killed by night; and he was obliged to pretend ignorance of the person who did it, and a belief of it's dying of disease.'

'What,' said I, with an air of surprise, 'are

these men of nature acquainted with envy, hatred, and mean revenge? Among us there are first-rate wits, who maintain, that these passions arise only in civilized society.'

'Ah,' replied Mr. Wells, 'let them spend three months among the savages, and they will return converts.' He then confirmed all I had heard at Fort Vincents and in Kentucky of the anarchy and private malice prevailing among these tribes, whether wandering or settled. He told me, that the assemblies of old men had no coercive power over the young: that the first mutinous or superstitious young warrior might in one morning excite a rising of young men, always turbulent because idle, and stir up a war, that would involve the whole tribe: and that such events were not occasioned by intoxication alone, and consequently arising from their intercourse with the whites, but by superstitious notions common to all the savages, and a certain restlessness of mind and body, a peculiar thirst of blood allied to the nature of tigers and wild beasts. He related to me very curious particulars of all the petty tricks of villages or neighbouring places, the great and violent animosities thence arising, the implacable hatreds for the slightest affront, and the vengeances of retaliation for every death or mutila-

lation. I had a striking example of this before my own eyes at Fort Miami, in the person of the Blue Jockey, a celebrated chief. This savage, being drunk, met another, to whom he had owed a grudge two and twenty years. Being alone, he took advantage of the opportunity, and killed him. The next day all the family was in arms, to demand his death. He came to Fort Miami, to captain Marshal, the commanding officer, who told me the story, and said to him: 'Let them kill me, it is but equitable: my heart has betrayed it's secret; the liquor robbed me of my senses: but to kill my son, as they threaten, that is not just. Father, see if it cannot be made up. I will give them all I have in the World; two horses, my trinkets of gold and silver, my finest weapons, one set excepted. If they will not accept these, let them appoint a time and place, I will meet them alone, and they shall kill me.'

This law of retaliation is found among all barbarous nations, that is to say, among those who have no regular government, because, from want of public authority, it is the only protector of individuals and of families. To suppose, that has it descended or been borrowed from the Hebrews or Arabs, is a revery to be left to those visionaries, who build the history of all nations on an

embryo. It may indeed have been the Arabs, who established it in Italy, in Spain, in Corsica *, &c.; but it is very possible, that barbarism introduced it there before them, and without their assistance.

'Yet,' added Mr. Wells, 'the Indians of the Wabash, the Miamis, Putewoatamies, &c., are better than they were three or four score years ago. The peace they have enjoyed in consequence of the decline of the Six Nations has enabled them to cultivate with the hoe Indian corn, potatoes, and even our cabbages and turnips: our prisoners have planted peach and apple trees, and taught them to breed poultry, pigs, and lately cows: in short, the Chactaws and Creeks of Florida are not farther advanced.'

Now when I consider, that the first travellers and historians of Virginia and New England describe these savages in a state of still greater advancement: that they tell us each tribe, on the arrival of the first settlers, had a sachem, or sagemore, exercising a sort of monarchical authority: that there were privileged and almost

* During three months that I spent in Corsica, I had authentic information of a hundred and eleven private assassinations, from these vengeances of retaliation. Under the Genoese government there were as many as nine hundred yearly. What a government! and what a people!

noble families, as among the Arabs: and that these tribes, tolerably populous, were confined within limits of moderate extent: I consider myself authorised to conclude, that they were then in a higher state of civilization; that they themselves would ultimately have raised it to the same pitch as it has reached in the other continent: and that their wars with Europeans have plunged them into anarchy, by destroying their governments: so that among the savages, as in civilized nations, different epochs of their history are to be distinguished; and their states also have their revolutions, so much the more easily effected, as they are smaller and more feeble.

The Weeaw chief, who harangued me at Fort Vincents, said to me: 'before this war,' (the war from 1788 to 1794) 'we were united and tranquil: we began to cultivate Indian corn like the whites. Now we resemble a herd of deer chased by the hunters: we have no longer house or home, we are all of us scattered abroad, and soon no traces of us will remain, unless some one come to our assistance.'

During these explanations the Little Tortoise appeared to me very attentively observing from the window what passed in the market in Second street. To engage him again in the conversation, I informed him, that I had travelled among a

people strangely differing from his: that there a handful of men, perhaps five or six thousand horsemen, had inconceivably found out the means of imprisoning as it were in an extent of country almost equal to the Ohio a whole nation of two millions and half of people; so that about three hundred and seventy individuals suffered themselves to be plundered, imprisoned, beaten, and harassed in all manners, by one single man, who was no stronger than either of them. Knowing the proud and independent notions of the savages, I expected, that he would have exclaimed against this warmly; but, stroking his chin with a thoughtful air, he answered: 'with all this, no doubt, they too have enjoyments after their fashion.' I confess it was I who was astonished at this answer, which displays a mind emancipated from the prejudices of it's country and education, and capable of estimating the prodigious power of habit.

To terminate our discourse, I inquired what so much engaged his attention in the street and the market, and what surprised him most in the city of Philadelphia.

'In observing all these people,' replied he, (it was on a market-day), 'two things ever astonish me: the extreme difference of the countenances, and the numerous population of the whites. We

red men do not resemble one another, each has a particular face, but still there is a family likeness. Here I perceive a confusion that puzzles me. There are ten different shades between black and white; and the features, the forehead, nose, mouth, chin, black, brown, light hair, blue, gray, and chesnut eyes, exhibit such a diversity, as I cannot explain.'

I then acquainted him, that Philadelphia being the resort of people from all parts of the globe, and these people afterward intermarrying, it followed, that the varieties of climates must produce subvarieties and combinations to infinity by mixture of blood. But, I added, if you were to visit the inland parts of our countries, as France, or England, you would see, that the inhabitants of villages, who intermarry with one another for several generations, have a general resemblance in their physiognomies. In fact this is what I have often observed in parishes far in the country, particularly in the woodlands of Rennes, Laval, Château-Briant, &c. Posting myself at the door of the church as the people were coming out, I remarked general characters striking for their resemblance in each place, and their peculiarities in different places.

'As to the population,' said the Little Tortoise to me, 'the increase of the whites is incon-

ceivable. More than the lives of two men have not elapsed, supposing each to have lived four-score years, since they first set foot in this country, and they already cover it like swarms of flies and gnats; while we, who have inhabited no one knows how long, are still as thin as deer.'

Finding him in the track of an interesting question, I asked him, why they did not increase equally fast. 'Ah,' replied he, 'our case is very different. You whites have found means of collecting at hand and in a small space a certain and abundant supply of food: from a piece of ground fifteen or twenty times as big as this room a man gathers enough to feed him all the year: if to this he add another plot sown with grass, he breeds animals that supply him with meat and clothing: and all the rest of his time he may do what he pleases. We, on the contrary, require a vast extent of ground to live upon; for to each deer we kill, and one will serve us but a couple of days, a considerable extent of ground is necessary to find nourishment and attain his full growth. If we eat or kill two or three hundred in a year, it is the same thing as if we ate the wood and grass of all the ground on which they live, and they require a great deal. In such a state of things, it is no wonder the whites have driven us year after year

from the borders of the sea to the banks of the Missisippi. They spread like oil upon a blanket; we dissolve like the snow before the vernal Sun: if we do not change our course, it is impossible for the race of red men to subsist.' This reply convinced me, as no doubt it will every reader, that this man has not without reason acquired in his own nation and in the United States the reputation of a person superiour in understanding to most of the savages.

Here then we have a savage, who, in opposition to the prejudices of his birth, of his habits, and of his self-love, and to opinions sanctioned by age and still prevailing among his countrymen, has been led by the nature of things, to discover the essential basis of the social state in the *cultivation of the earth*, and, as an immediate consequence, in *landed property*; for without the exclusive and unconditional possession, that constitutes property, there can be no active and stable cultivation. I have said, contrary to opinions sanctioned by age, and still prevailing among his countrymen: for in all these tribes there is a generation of old warriors, who, when they see a man handling the hoe, are incessantly exclaiming against the degeneracy from ancient manners; and who pretend, that the decline of the savages is entirely owing

to these *innovations*, and that to recover their ancient strength and ancient glory, nothing is necessary but a return to their primitive manners *.

Now let any one compare this doctrine with that of the citizen of Geneva, who maintains, that the depravation of the social state originates from the introduction of the right of property; and who regrets, that the savage horde, among whom the first boundaries of a field were placed, did not pull up every stake as a sacrilegious fetter imposed upon their natural liberty †: let him consider, which of the two has the greater right and authority to decide upon the question; a man in public life, who, like the Little Tortoise, has possessed opportunities of knowing the advantages and inconveniences of each way of living, by spending fifty years in the management of difficult affairs,

* It is curious to remark, that these old men reason exactly like Machiavel, the coryphæus of Italian politicians, who, in his Commentaries on the Decades of Livy, book 3, chap. 1, in like manner directs, for the purpose of restoring decayed states, that their civil and religious institutions should be brought back to their origin. The paradox is palpable in the present case. On reading the works of this writer over again, I find, that a thorough analysis of most of his principles would reduce his reputation for knowledge and ability to a rank far below what he enjoys.

† See his Discourse on the Origin of the Inequality of Conditions.

and guiding turbulent and jealous minds, with a success that has earned him an undisputed reputation of prudence and ability; or a private individual, who, like Rousseau, never had the management of the least public business, or even knew how to conduct his own; who, having created to himself a World of abstract ideas, lived almost as much a stranger to the society in which he was born, as to that of the savages, of whom he knew nothing but by comparisons drawn from the forest of Montmorenci; who even did not treat this question at first in a paradoxical light but as an exercise of wit and eloquence; and supported it as a truth solely from despite at having his humour thwarted, and his vanity stung *.

* What I here advance is founded on some of those little facts, that are very interesting in the history of great things; and which I had from two authorities worthy of credit, the late baron von Holbach, and Mr. Naigeon, now member of the Institute. At the time when the academy of Dijon proposed it's too celebrated prize question, Diderot was confined in the castle of Vincennes for his Letter *on the Blind*. Rousseau sometimes went to see him. On one of these visits he showed him the question proposed, and said, 'it is a striking subject, I have a mind to enter the lists.' 'Very well,' answered Diderot, 'but in what sense do you take up the question?' 'In it's natural sense; can it have two? can the arts and sciences have any other effect, than to promote the prosperity of a state?' 'Well then,' re-

It is so much the more to be regretted, that this writer embraced such a bad cause, as the question seen in it's true light would have afforded him still ampler scope for displaying his talents, and declaiming against the vices and corruption of society. For if he had first established or admitted

joined Diderot, 'you will be a carrier of coals to Newcastle [*un enfonceur de portes ouvertes*]. (These were his very words.) It would be far more striking, to maintain the reverse.' Rousseau went away struck with this idea; wrote an essay on these principles; and the *country academy* awarded it the prize.—Some time after, Holbach and Diderot, walking in the Cours-la-Reine, met Rousseau, joined him, complimented him on *his display of strength* [*tour de force*], and Rousseau joked with them on the success of his paradox, and the *simplicity* [*bonhommie*], of the academicians. Criticisms and contradictions arose: Rousseau was irritated: Holbach and Diderot, constant walking companions, met him in the Thuileries: the question was brought on the carpet again, and they were astonished to find Rousseau so sore and altered in opinion, that he seriously maintained as a *truth*, with all the vehemence natural to his temper, what at first he had treated himself as a joke. Holbach was struck with it, and said to Diderot; 'Rousseau, my friend, in his first work, will make man walk upon all fours:' and his prophecy was but too true.

Here then we have the point, from which the system of a man, whose motto was *Vitam impendere vero*, [to spend his life in the pursuit of truth], took it's departure: and this man has in the present day sectaries, who approach so near to fanaticism, that they would willingly send every one to Vincennes, who does not admire the *Confessions*.

the facts as they are; if, drawing a true picture of savage life, he had shown, that it is a state of *non-compact* and anarchy, in which wandering unconnected men are moved by violent necessities, by passions analogous to these necessities, and act incessantly on each other with strength abused, the *inequality* of which prevents that *equilibrium*, that is termed *justice*: if then, defining *civilization*, he had traced it's meaning to that of it's root, (*civitas*, a city), he would have shown, that by civilization ought to be understood the union of these men into a city, in other words a number of habitations enclosed and provided with a common defence, to protect them against plunderers from without and disorder within; and that this union carries with it the ideas of the voluntary consent of it's members, the preservation of their natural right to security of person and property, and the supposition or existence of a mutual compact, regulating the employ of strength, circumscribing liberty of action, and in short establishing a system of equity. Thus he would have demonstrated, that civilization is nothing but a social state preserving and protecting persons and property: that no people are truly civilized, but they who have equitable laws and regular governments: and on the contrary that they, among whom such an order of things does not exist, are in a barbarous and savage state, and do not

deserve the name of a civilized people: he would have demonstrated with the advantage derived from truth, that, if these people be vicious and depraved, it is not because their uniting in society has given birth to vicious inclinations, but because these have been transmitted from the savage state, the original stock of every nation, of every formation of a government; and this in the same way, in which an individual educated in bad habits retains the impression of them throughout his life.

On the other hand, examining the part that the sciences and fine arts act in the system of bodies politic, he might have maintained, that the arts in particular, poetry, painting, and architecture, are integral parts of civilization, and certain characteristics of the happiness and prosperity of a people. He might have proved by examples drawn from Italy and Greece, that they may flourish in countries subjected to military despotism, or a licentious democracy, both equally of a savage nature: that to render them flourishing it is sufficient for a government temporarily strong, whatever it may be, to encourage and reward them; but that the common consequence of such encouragement carried beyond due bounds is the ruin of these governments themselves, in the same way as private amateurs are daily dissipating ample fortunes by an im-

prudent passion for pictures, furniture, and luxuries of every kind, and above all for building; so that the fine arts, when cherished at the expense of taxes on the community, and to the detriment of arts less refined but of primary utility, may very frequently become the means of ruining the finances, and in consequence subverting civilization and the social state: and he might have supported his argument by the examples of Athens, Rome, Palmyra, &c.; and done us the important service of giving a temperate and just direction to men's minds, that would have prevented or counterbalanced the false and extravagant bias, the sad consequences of which have been exhibited to us within these few years. But to return to the savages of America, and their mode of life.

We have seen the chief reason why this life is incompatible with a numerous population. It would be an interesting theme, to compare in this respect it's results with those of civilized life, whether agricultural or commercial, and to know generally on an average how many savages exist on a given number of square miles. Unfortunately we want accurate data for the solution of this problem: but as we have some, that may be deemed approximations to the truth, we will endeavour to make a calculation of it.

Carver, who in 1768 resided several months

among the Nadowessees of the plains of the Missouri, lays it down as an established fact, that the eight tribes forming that nation reckon no more than two thousand warriors. This number does not admit above four thousand old men, women, and children: accordingly the total amount is six thousand. Now the vast tract of country occupied by these eight tribes appears to be four or five times as large as Pennsylvania. Let us suppose four times: Pennsylvania contains 44813 square miles, which quadrupled give 179252; consequently there is but one person to near 30 square miles. Maupertuis, in his account of his journey toward the pole, estimates the population of Lapland at one to three square miles, and the Laplanders live in peace under a civilized government. This datum, though the reverse of the former, proves it nevertheless not to be merely conjectural. All the Canadian traders agree, that, as you proceed northward from the latitude of 45°, the savages are so thinly scattered, and the land so steril, that we can scarcely admit a higher calculation than for the Nadowessees: but since the soil improves as we proceed southward, and the borders of the Pacific ocean appear more populous, let us admit one person to eighteen square miles throughout the whole of North America:

the superficies of that continent, excluding Mexico and the United States, may be estimated at six times that of the United States, or six millions of square miles. This would give about 334000 savages *: but let us admit, though it is beyond all

* This leads us to estimate in a probable manner the population of the whole of this continent.

	Persons.
The United States are known to contain -	5215000
The Spaniards admit the population of Mexico to amount to - - - - -	3000000
Canada in 1798 reckoned 197000: say -	200000
Upper and Lower Louisiana cannot be set down at more than - - - - -	40000
The two Floridas, about the same number -	40000
The Creeks, Chactaws, and Chicasaws, who have 8000 warriors - - - - -	24000
All the savages on the Wabash and Michigan, at most - - - - -	15000
The rest of the savages throughout the continent taken together, as far as the Frozen Ocean and the sea of Nootka Sound - - -	600000
Total	9134000

Thus the population of all North America very little exceeds nine millions, and we may consider the last article, that of the savages, as too great by perhaps half.

South America does not appear to have attained an equal number. Well informed Spaniards do not estimate the population of all their posssessions in this part of the World,

possibility 670000, it will nevertheless follow, that it is only the population of a middling province of six or seven thousand square miles in a civilized nation. And this fact alone determines which

namely Peru, Chili, Paraguay, la Plata, and even Caraccas, not including the unsubjected Indians, at -	4000000
In Brazil are reckoned 500000 Portuguese and 600000 Negroes - - -	1100000
Total	5100000
The Indians not subjugated can scarcely be estimated with precision, but, considering the territory they occupy, they cannot equal in number half the whites. I reckon them therefore only at - - - -	1000000
The colonies in the West India islands and Isthmus of Darien do not exceed - -	1800000
Dutch and French Guiana cannot be more than	75000
Total	7975000

Thus we have about eight millions: but let us suppose ten, still the population of North and South America taken together cannot exceed twenty millions.

This calculation differs widely from those of my honourable colleague in the Institute, Mr. Lalande the astronomer, who in the Yearbooks of the years 8 and 9 reckoned a hundred and eighty millions of inhabitants in the new world. It is true in the years 9 and 10 he suddenly fell to sixty millions, that is to say to the half*: and at length in the pre-

* If both the numbers here given be right, it should be to one-third. As I could not get the work referred to, I know not where the errour lies. T.

kind of life has the advantage: as it also does beyond a doubt the question, whether savages have any reasonable right to refuse land to agricultural

sent year, 12, he has adopted my calculation, which was communicated to him by some of our common friends, members of the board of longitude. He ought to act in the same manner with the five hundred and eighty millions he attributes to Asia. No doubt he reckons China for two or three hundred millions of these. But in the enumeration published last year by the English the population of the country amounts only to 55 millions: and supposing that of the cities to equal it, which is allowing a great deal, this would make 110 millions; and by comparison with Europe this empire cannot exceed - - - - 120000000

Persia, according to Olivier, has only -	9000000
On a particular examination of all Turkey in Asia, I cannot find more than - -	11000000
I do not think therefore all Asia, including these, contains more than - -	240000000
Europe is well known to contain 140 or 142 millions: say - - -	142000000
Africa, including Egypt, can scarcely be more populous than America: but let us admit - - - -	30000000
America - - - -	20000000
Lastly for the South Sea islands, New Guinea, &c., let us allow, though it is too much -	5000000
Thus we shall have for the whole globe a total of - - - - -	437000000

and cannot make it reach five hundred millions.

nations, who have not a sufficiency for their subsistence.

In both these points, that of population, and the mode of occupying their territory, the American savages resemble the Bedoween Arabs of Asia and Africa: but there is this essential difference between them, the Bedoweens, living on a land affording very scanty pasture, have been obliged to collect together and tame harmless and patient animals, to treat them with gentleness and frugality, and to live on their produce, milk and cheese, rather than on their flesh; as well as clothe

It is not to be wondered at, that people are much deceived in calculating the population of uncivilized countries, since we have instances of *inconceivable* mistakes at home. For instance, till the year 1792 only 158000 inhabitants were reckoned in Corsica, as I have seen on the returns of the directory at Corte: at present Corsica stands in all our official accounts for 230000. It may be asked, how is this possible? The following is the fact. In 1793 some *Corsican patriots* found it beneficial, to have two departments instead of one, in order to have double salaries of every kind, all paid by France. The ancient total of 158000 was given to the department of Golo; and to that of Liamone were added the 72000, which it may possibly contain, though they were already included in the former number. Thus in one morning Corsica acquired nearly half as many more inhabitants, though it is certain, that they have diminished in number since 1790. Yet this is an official account, to which no objection is made.

themselves with their wool, rather than with their skins. Thus from the nature of local circumstances they have been led to adopt the pastoral life, and to eat with temperance under pain of perishing for want of food : while the American savage, placed on a soil abounding with grass and shrubs, finding it difficult to retain captive animals always ready to flee into the woods, and feeling it more pleasant to pursue them there, as well as more convenient to kill than to feed them, has been led by the nature of his situation to become a hunter, *a shedder of blood*, and an eater of flesh.

From this difference in the mode of subsisting has proceeded a proportional difference in their manners and propensities. On the one hand the Arabian shepherd, compelled by necessity to the habitual practice of frugality, not daring to indulge himself in the gratuitous slaughter of his cattle, and accustoming himself even to love them from a sense of property, has naturally acquired less ferocious manners; has been more fitted to unite in society, to acquire a spirit of family, to know and establish rights of property and inheritance, and to imbibe all the sentiments, that flow from these. And in fact there exists among the Bedoweens a state of society much farther advanced. They have a real government, in some instances patriarchal, where the head of a family

exercises an authority over his kindred and servants; in others aristocratic, or the government of several heads of families associated together. At the same time as the private manners of individuals have influenced or even formed the public manners of whole tribes, these tribes, experiencing but a slow and gradual want of extending their pastoral domain, have not displayed such a warlike, that is such a quarrelsome and sanguinary character abroad. Having more objects of property, and more desire and want of conversation, they have had ampler ideas of mutual equiponderance and justice, more secure rights, more precise compacts of territorial possessions, asylum, and hospitality, in short greater maturity of civilization.

The American savage on the contrary, a hunter and *butcher*, who has had daily occasion to kill and slay, and in every animal has beheld nothing but a fugitive prey, which he must be quick to seize, has acquired a roaming, wasteful, and ferocious disposition; has become an animal of the same kind with the wolf and tiger; has united in bands or troops, but not into organized societies. Unacquainted with the ideas of property and of preservation, he has remained a stranger to all sentiments of family, and of a care to preserve, which these inspire. Confined to his own powers, he has been obliged to keep them incessantly bent to their ut-

most stretch; and hence an independant, restless, unsocial humour; a proud untamable spirit, hostile toward all men: an habitual state of excitement in consequence of permanent danger; a desperate determination to risk at every moment a life incessantly threatened; an absolute indifference to the past, that has been toilsome, and to the future, that is uncertain; and lastly an existence wholly confined to the present. These individual manners, forming the public manners of the tribes, have rendered them equally thriftless, greedy, and continually under the yoke of necessitousness; and have occasioned the habitual and increasing want of extending their rights of chase, the frontiers of their territory, and invading the domains of others. Hence more hostile habits without, and a more constant state of war, irritation, and cruelty; while within the excessive independence of each member, and the absence of every social tie from the want of all subordination and authority, have constituted such a turbulent and *terrorist* democracy, that it may well be called a real and fearful anarchy.

I have said, that no right of property exists among the savages. This fact, though generally true, requires however some more precise distinctions. Travellers are agreed in saying, that even the most vagabond and ferocious savage has an exclusive possession of his arms, clothes, trinkets,

and movables: and it is remarkable, that all these objects are the produce of his own labour and industry; so that the right of this kind of property, which is sacred among them, evidently derives from the property every man has in his own body and limbs, consequently is a natural property. These travellers add, that landed or fixed property is absolutely unknown: which is true in general among all the tribes, that are constantly wandering; but there are cases of exception among those, whom the goodness of the soil, or any other reason, has rendered sedentary. Among tribes who live in villages, the houses built either of trunks of trees, of mud, or of stones, belong without dispute to the man by whom they were erected. There is a real property in the house, in the ground it covers, and even in the garden, that is sometimes annexed to it. Instances of this may be found among the Creeks and Putewoatamies, and existed among the Hurons, Six Nations, and others, as early as the beginning of the last century. It appears farther, that in certain nations, where agriculture has made some progress, the children and relations inherited these: consequently there was a full and permanent right of property. But in other nations, at the death of the possessor all was confounded together, and became objects of division either by lot or choice.

In this case men were only usufructuaries. If the tribe migrate for some time, and desert it's village, the individual then retains no positive right to the soil, or the ruined hut; but he has those of the first occupier, and of the labour bestowed by his own hands.

The remainder of the land, this small portion excepted, is undivided among all the nations, and remains in common; as we see still is the case with certain portions of land in some parts of France, particularly in the country of the Lower Loire, and the peninsula of Bretagne, but much more generally in Spain, Italy, and all the countries bordering on the Mediterranean. What I have seen in Corsica has struck me by it's extreme analogy to it. There, as among the savages, the greater part of the land of most of the villages is in common; and every inhabitant has a right to pasture his cattle on it, cut wood, &c. But as cultivation is a little more advanced in Corsica, a fourth or fifth part of this land is ploughed and sown annually in rotation. For this purpose it is divided into as many portions as there are families or individuals having a right in the land, and each cultivates the portion that falls to him by lot, possessing it for that year: but as soon as the corn is housed, the land again becomes public property, or rather public rapine and devastation, for every

one has a right to take what he finds on it, but no one to put any thing in. No one can build a house, or plant a tree there, and it is a real *savage* desert, given up to be traversed and wandered over by the flocks, which in great part consist of goats: and as these destructive animals, as well as their guides, seek only to extend their ravages, individual possessions find a constantly renewed want of enclosing, that almost renders them more burdensome than advantageous. Accordingly, having often investigated and analyzed the causes of the barbarous and *half savage* state, in which Corsica has continued so many centuries, though surrounded by civilized countries, I have found, that one of the most radical and active causes is the undivided and common state of the greater part of it's territory, and the small number aud restraint of private possessions*.

* To the same cause must be ascribed the poverty and rudeness of the people on our heaths in Bretagne. The numerous inconveniences arising from it in England and Scotland have been so well unfolded by sir John Sinclair, that I need only refer the reader to his Essay on Commons and Waste Lands: but I will add, that in Corsica this likewise gives rise to the frequency of waylaying and assassination, for, the land being a desert, the murderers are encouraged by the absence of witnesses. In reflecting on the means of civilizing this island, and other countries on the Mediterranean, I am convinced, that the abolition of these commons

There is another resemblance between the savages of America and the mountaineers of Corsica. The villages of both commonly consist of scattered and distant houses, so that one of fifty will sometimes occupy more than half a mile square. On examining into the motives of this custom, totally opposite to that of the oriental countries, I have found, that with the American savage they are an aversion to being observed and under constraint

should every where be the first law. A second, not less indispensable, though less obvious, in order to prevent landed property from centring in a few families, should establish, as at Sparta, a certain number of estates to remain indivisible, and incapable of being held by the same proprietor; so that there must always be as many possessors of landed property in easy circumstances as there are estates of this kind. Small countries cannot govern themselves like great ones; the balance in them is too variable. Our custom of Bretagne had a similar object in the *congéable* estates in the countries of Cornouailles and Rohan. These estates always descended to the youngest son: the elder only received a certain portion, as being more capable of acquiring another settlement for themselves; and the districts where this law prevailed have always been the best cultivated. Corsica might easily support thirty thousand such families, industrious and independent: it has not more than this, and almost all of them poor and idle. But without independence, there can be no mental improvement, no agriculture, no industry, no individual or national character. Perhaps it was on this account, that Pascal Paoli, in imitation of the Genoese, never made any change in the ancient customs.

from his neighbours, and still more a mistrust of the ambushes with which he may be surrounded in consequence of avowed or dissembled animosities, and even involuntary offences committed against men as jealous and irritable as he knows himself to be. Daily experience gives them such a bad opinion of each other, and renders them so suspicious and mistrustful, that they meet as seldom as possible, and never go abroad unarmed: and the terrible practice of vengeances of retaliation, common to all savages, still adds to these motives of wariness and caution. They who are acquainted with Corsica know whether the same usages and the same habits have there different causes: and if this comparison, which might be extended to many other objects, appear mortifying and painful, I would ask, whether the people, victims to their ignorance and passions, must bear the reproach of these evils, or that Genoese government, which maintained or gave rise to them, by one of the most perverse systems that history exhibits to our view. As to me, whom the mildness of the climate and fertility of the soil in certain parts invited to that island, in order to form a rural establishment of a singular kind*, I was con-

* As early as the year 1790, having foreseen the consequences, that the principles and more particularly the conduct of some friends of the blacks would have on our colo-

vinced, during a year's residence and study, that the people of Corsica, worthy of a better fate, want only five or six fundamental institutions, adapted to their situation, to render them as industrious and civilized as any nation; since their intellectual faculties are as clear as I have met with in any country, and their soil is much more productive, than is commonly supposed: but in three centuries to find thirty successive years of pacific and legislative government is a boon, which Heaven has ever been parsimonious in dispensing.

nies, I conceived it might be an undertaking of great public and private benefit, to introduce into the Mediterranean the culture of the productions of the tropics: and as several parts of Corsica are sufficiently warm, to allow orange trees twenty feet high, plantains, and date trees, to grow in the open air; and samples of cotton, coffee, and the sugar cane, had already succeeded there; I conceived the project of cultivating these articles in that island, and awakening this kind of employment by my example. With this view I purchased in 1792 a very promising spot, called the domain of Confina, near Ajaccio. I persuaded myself, that Pascal Paoli, having been treated with so much confidence and generosity, would employ his old age in maintaining the peace of the country, and protecting it from the concussions to which the rest of France was exposed. Unfortunately men are the machines of habit, who in their old age repeat like automatons the first movements with which they were animated. Paoli resumed all his ancient schemes of personal sway and family sovereignty, and the folly of seating himself in a throne, which he had caused to be erected in 1768, and the

What I have said of the motives of war among savages sufficiently shows, that they must be frequent and almost constant; and this is one reason for their being cruel, since the habit of shedding blood, or merely seeing it shed, corrupts every feeling of humanity: but to this are added several others, arising both from the subject itself, and from it's concomitants, that have a powerful effect.

1. The selfishness, or spirit of personality, that every savage carries with him to war: a selfishness

remains of the fringe of which I was shown at Corte fastened to chamferings of wood. Conformably to this system, driving out the French by means of the English, to expel the English afterward by the Corsicans, and then subjugate the Corsicans by his family and party, he laid me under the necessity of quitting every thing: and from that friendship *(of a statesman)*, of which he had so many times given me an assurance, he put my *Little India* up to auction. But fate has been more just. This great Italian politician found himself in his turn disappointed and driven out like a credulous Frenchman; and his example has confirmed the axiom of those moralists, decried in vain in the present day, who say, that the Machiavelist by dint of deceiving others deceives himself, and that a rogue needs only to grow old, to become the dupe of his own knavery. I have since sold my estate with little loss (it is in the hands of cardinal Fesch); and I strongly suspect, that Paoli will not easily find a man of honour in France or England, who would be willing to buy at any price the only possession left him, his pension from the king of Great Britain excepted, *the place his name will occupy in history.*

founded on this, that every individual of the tribe, from the land being in common, considers the game in general as the fundamental means of his own subsistence, and consequently deems every thing that tends to destroy this as attacking or threatening his own life.

Among polished nations rich in private property, war is an evil that directly affects only a portion of the whole people, and frequently a very small portion: the majority suffers only a deprivation, through the medium of taxes, of part of their wealth and enjoyments, with which in strictness they can dispense. It is natural then, that such a war should excite only slight passions in it's movers and instruments, who fight and are killed less through necessity than from vanity, and in the way of a kind of trade, by which they gain money and honour. On the contrary among savage nations, poor and few in number, war directly endangers the existence of the whole society, and of each of it's members. It's first effect is to famish, it's next to exterminate the tribe: it is equally natural therefore, that every member should identify himself intimately with the whole, and display an energy carried to the utmost, since it is stimulated by the extreme necessity of defence and self-preservation.

2. A second reason of the animosity of these

wars is the violence of passions, such as the point of honour, resentment, and vengeance, with which every warrior is inspired. The number of combatants being small, every one is exposed to the eyes both of his friends and enemies: every act of cowardice is punished with infamy, the near consequence of which is death: and courage is stimulated by the rivalry of companions in arms, the desire of revenging the death of some friend or relation, and every personal motive of hatred and pride, often more powerful than those of self-preservation.

3. The nature of these wars, in which quarter is neither given, received, nor expected. The least danger is the loss of life, for if the savage be only wounded or made prisoner, the sole prospect before him is that of being scalped immediately, or burned alive and eaten in a few days. If the reader wish to know what scalping means, I will give him a description of it in the words of an eye-witness, John Long, an English trader, who was fond of the savage life, and resided twenty years among the Indians.

'When an Indian strikes a person on the temple with a tomahawk, the victim instantly drops; he then seizes his hair with one hand, twisting it very tight together, to separate the skin from the head, and placing his knee on the breast, with the

other he draws the scalping knife from the sheath, and cuts the skin round the forehead, pulling it off with his teeth. As he is very dextrous, the operation is generally performed in two minutes. The scalp is then extended on three hoops, dried in the sun, and rubbed over with vermillion.' Long's Travels, p. 22.

The operation is not always fatal. 'There are instances of persons of both sexes, now living in America, who, after having been scalped, by wearing a plate of silver or tin on the crown of the head, to keep it from cold, enjoy a good state of health, and are seldom afflicted with pains.' Ib.

I may add, that the colony of Gallipolis has furnished another instance in the person of a German.

Scalps are trophies of glory, and honour consists in having a great number.

As to being burned alive and eaten, it is sufficient to look into any relation of a war with the savages, to be informed, that the common fate of prisoners of war is to be fastened to a stake near a pile of burning wood, there to be tortured for several hours with every refinement of barbarity that rage can invent. What is related of these terrible scenes by travellers, who have witnessed the cannibal joy of the actors in them, and particularly the fury of the women and children,

and with what atrocious delight they emulate each other in acts of cruelty *: what they add of the heroic firmness, and unalterable coolness of the sufferers, who not only express no sensation of pain, but brave and defy their tormentors with the haughtiest pride, bitterest irony, and most insulting sarcasms; chaunting their own exploits; enumerating the friends and relations of the spectators, whom they have slain; particularizing the tortures they inflicted on them; and accusing them all of cowardice, pusillanimity, and ignorance in the art of tormenting; till dropping piecemeal, and devoured alive before their own eyes by their enemies drunk with rage, they lose their last breath with their last words: all this would be incredible to civilized nations, were not the truth established by incontrovertible testimony, and will some day be treated as fabulous by posterity, when savages no longer exist. Examples of it still occur daily in America beyond the Missisippi, take place every year among the savages on the Wabash, and sometimes may be seen among those of Florida.

After this let sentimental dreamers come forward, and boast the goodness of the man of na-

* See Carver, chap. 9; John Long, end of chap. 8 and chap. 9; Lahontan, Adair, &c.

ture. An almost equal errour is that of writers, who, like Pauw, suppose it may be owing to a want of feeling, that savages endure so patiently such horrible tortures. Were this the case, assuredly they must be more insensible than an oyster or a tree. The truth is, this phenomenon in physiology depends on a peculiar state of mind, violently exalted by the passions: a state of which we see numerous examples in the martyrs to religion or politics of all nations, and in all countries. The savage, as well as these martyrs, is in that frame of mind called fanaticism, which is a violent persuasion, a blind certainty, of all right, all truth, being concentred in his cause; seeing on the side of his enemies all errour, and all malice; admitting neither doubt nor reasoning; and on these accounts being profoundly penetrated, like martyrs, with a sentiment of pride, which exalts him in his own eyes far above his tormentors, and establishes between him alone and them all a contest of self-love, a strife of vanity who shall hold out longest: and we see in society, that this kind of strife daily produces the most extravagant effects, as those of the rage of gambling, the madness of war, duels, conquests, &c. The fanaticism of martyrs to religion is commonly founded on the hope of another life: that of the savage wants this support, and for this reason his courage

is the more astonishing, and has in some respect more merit: but it is stimulated by despair, and the impossibility of saving himself by retractation or weakness; he resembles those animals, that, attacked in their last retreat, defend themselves without any hope of escape; and we know what prodigious efforts nature will then display in the weakest and most timid. In the savage it is the accumulated action of fanaticism and necessity; and on this double basis the Tatar Odin was able to build his insane religion: but a very interesting physiological problem nevertheless remains still to be resolved, namely: what is that singular state of the nerves, what that movement of the electric fluid, by which sensibility is deadened or exalted to such a pitch, as to annihilate pain? This question well deserves to be the subject for a prize in medical schools*; as it would

* Physicians and surgeons of military hospitals have frequent opportunities of observing, that patients, who in a calm state of the mind and senses would have uttered cries of pain during amputations or other operations, on the contrary display firmness, if they be prepared in a certain manner. This consists in piquing their vanity and sense of honour; in pretending, at first artfully, and then with irritating contradiction, that they are incapable of going through the operation without crying out. It almost always happens, that this moral and physical excitement produces a state of tension, by which they are enabled to support pain with a

be another worthy of those learned societies that turn their attention to morals, to inquire in what that state of mind called fanaticism consists; what are it's predisposing and preparatory causes both in education and disposition; and what are the means of remedying it; and farther to examine, whether the effects of fanaticism, applied to no matter what opinion, be more pernicious to the individual and to society, than the spirit of scepticism, uncertainty, and incredulity.

4. The last motive to ferocity in the wars of the savages, and in their entire character, is the whole system of their education, and the direction that parents endeavour to give to their inclinations from the earliest age. 'From their infant state,' says Long, p. 60, 'they endeavour to promote an independent spirit; they are never known to beat or scold them, lest the martial disposition, which is to adorn their future life and character, should be weakened: on all occasions they avoid every thing compulsive, that the freedom with which they wish them to think and act may not be controlled.'

I add, that here, as throughout the whole sys-

degree of firmness, of which they would otherwise have failed. To say what passes on this occasion in the nervous and sanguineous systems, is one of the elements of the problem.

tem of savage life, self-preservation is still the acting motive; for it is to procure themselves more intrepid defenders, that these mothers thus spoil their children, who, at some future day, according to the general practice of these people, will despise, domineer over, and even beat them. Sometimes they spend their evenings in relating the noble deeds and courageous acts of their relations, or of the heroes of the tribe: how during their lives they killed, scalped, and burned such a number of their enemies; or how, having had the misfortune to be taken prisoners, they endured the most horrible torments with the proudest bravery. At other times they entertain them with the domestic quarrels of the tribe, their causes of complaint against some of their neighbours, and the precautions to be taken in order to revenge them opportunely: thus they give them at once lessons of dissimulation, cruelty, hatred, discretion, vengeance, and bloodthirstyness. They never fail of seizing the first opportunity of a prisoner of war, to have their children present at the punishment, to tutor them in the art of tormenting, and to make them partakers of the cannibal feast, with which these scenes terminate. It is obvious, that such lessons must make a profound impression on a young mind. Accordingly their constant effect is to give the young savages an intractable, impe-

rious, rebellious disposition, averse to all contradiction and restraint, yet dissembling, knavish, and even polite: for the savages have a code of politeness, not less established than that of a court: in short, they contrive to make them unite all the qualities, necessary to attain the object of their prevailing passion, the thirst of revenge and bloodshed. Their frenzy in the last point is a subject of astonishment and affright to all the whites who have lived with them.

'An impartial mind,' says Long, p. 27, 'will require but little to be persuaded, that the Indians are superiour to us in the woods: it is their natural element (if I may be allowed the expression), and a tree or river, of which their recollection never fails, guides them to the secret recesses of a deep wood, either for safety, or the purposes of ambush. As they pay little attention to the rising or setting Sun, it at first surprised me, by what method they travel from place to place, without any material aberration; but this they soon explained, by assuring me, that they had not the least difficulty in going from one spot to another, being governed by the moss on the trees, which always remains on the north side, but on the south it wastes and decays: they remark also, that the branches are larger, and the leaves more luxuriant on the south than on the north side

of the tree. The most enlightened part of mankind, I am persuaded, cannot be more exact in their mode of judging, or more attentive to the works of nature . . . . . p. 29. The disposition of the Indians is naturally proud and selfsufficient: they think themselves the wisest of the sons of men, and are extremely offended when their advice is rejected. The feats of valour of their ancestors, continually repeated and impressed upon their minds, inspire them with the most exalted notions of their own prowess and bravery; hence arises the firmest reliance on their own courage and power; and though but a handful of men, comparatively speaking, they are vain enough to think they can overthrow both French and English whenever they please. They say, the latter are fools, for they hold their guns half man high; and let them snap; but that they themselves take sight, and seldom fail of doing execution, which, they add, is the true intention of going to war. . . . . p. 27. Even the great Washington incurred their censure by his conduct, and gave occasion to an Indian chief, of the name of Thanachrishon, of the Seneka tribes, judging him by their own rules, to say, that he was a good natured man, but had no experience. . . . . p. 37. However, with regard to bodily strength, they are excelled by many; and even in hunting, the Virginians equal them

in every part of the chace, though all the world allow them the merit of being good marksmen. . . . . p. 30. The Iroquois laugh when you talk to them of obedience to kings; for they cannot reconcile the idea of submission with the dignity of man. Each individual is a sovereign in his own mind; and as he conceives he derives his freedom from the great Spirit alone, he cannot be induced to acknowledge any other power. They are extremely jealous, and easily offended, and when they have been once induced to suspect, it is very difficult to remove the impression. They carry their resentments with them to the grave, and bequeath them to the rising generation. Those who have associated with them, though they may admire their heroism in war, their resolution in supporting the most excruciating tortures, and the stability of their friendships, cannot but lament the dreadful effects of their displeasure, which has no bounds. It is this violence of temper, which is generally in the extreme, that makes them so difficult to subdue, and so dangerous to encourage; too much indulgence they attribute to fear, and too much severity brings on resentment. . . . . p. 76. It is very strange, that the thirst of blood should stimulate the human mind to traverse such an amazing extent of country, suffering inexpressible hardships, and uncertain of success, to gratify

a passion, which none but an infernal spirit could suggest*; and when success has crowned his labours, that he should return with inconceivable satisfaction, and relate the transactions of his journey, with the greatest exultation, smiling at the relation of agonies which he alone occasioned. The most dreadful acts of a maniac cannot exceed such cruelty.'

Thus on the whole it may be said, that the virtues of the savages are reducible to intrepid courage in danger, unshaken firmness amid tortures, contempt of pain and death, and patience under all the anxieties and distresses of life. No doubt these are useful qualities, but they are all confined to the individual, all selfish, and without any benefit to the society. Farther they are proofs of a life truly wretched, and a social state so depraved or null, that a man, neither finding nor hoping any succour or assistance from it, is obliged to wrap himself up in despair, and endeavour to harden himself against the strokes of fate.

Still it may be urged, these men in their leisure hours, laugh, sing, play, and live without care for the past as well as for the future: will you then deny, that they are happier than we? To this I will answer in the words of the Little Tortoise:

* See Carver, chap. 9 and 16, and Hearne's Journey.

'no doubt they too have enjoyments after their fashion.' Man is such a pliable and varying creature, and habits have such a potent sway over him, that in the most disastrous situations he always finds some posture that gives him ease, something that consoles him, and by comparison with past sufferings appears to him well-being and happiness: but if to laugh, sing, and play constitute bliss, it must likewise be granted, that soldiers are perfectly happy beings, since there are no men more careless or more gay in dangers, or on the eve of battle: it must be granted too, that during the revolution, in the most fatal of our jails, the Conciergerie, the prisoners were very happy, since they were in general more careless and gay than their keepers, or than those who only feared the same fate. The anxieties of those, who were at large, were as numerous as the enjoyments they wished to preserve: they who were in the other prisons felt but one, that of preserving their lives. In the Conciergerie, where a man was condemned in expectation or in reality, he had no longer any care: on the contrary, every moment of life was an acquisition, the gain of a good that was considered as lost. Such is nearly the situation of a soldier in war, and such is really that of the savage throughout the whole course of his life. If this be happiness, wretched indeed must be the country, where it is an object of envy.

In pursuing my investigation I do not find, that I am led to more advantageous ideas of the liberty of the savage: on the contrary, I see in him only the slave of his wants, and of the freaks of a sterile and parsimonious nature. Food he has not at hand, rest is not at his command: he must run, weary himself, and endure hunger and thirst, heat and cold, and all the inclemency of the elements and seasons; and as the ignorance in which he was born and bred gives him or leaves him a multitude of false and irrational ideas, and superstitious prejudices, he is likewise the slave of a number of errours and passions, from which civilized man is exempted, by the science and knowledge of every kind, that an improved state of society has produced.

The limits of my work do not allow me to enter into all the minutiæ of this interesting subject, and therefore I shall content myself with saying, that, the more deeply we examine the history and way of life of savages, the more ideas we acquire, that illustrate the nature of man in general, the gradual formation of societies, and the character and manners of the nations of antiquity. I am particularly struck with the analogy, that I daily remark between the savages of North America and the so much vaunted ancient nations of Greece and Italy. In the Greeks of Homer, particularly in those of

his Iliad, I find the customs, discourse, and manners of the Iroquois, Delawares, and Miamis. The tragedies of Sophocles and Euripides paint to me almost literally the sentiments of the *red men* respecting necessity, fatality, the miseries of human life, and the rigour of blind destiny. But the piece most remarkable for the variety and combination of features of resemblance is the beginning of the history of Thucydides, in which he summarily retraces the habits and way of life of the Greeks, before and after the Trojan war, up to the age in which he wrote. This fragment appears to me so well adapted to my subject, that I am persuaded the reader will be pleased at my laying it before him, so that he may make the comparison for himself.

Extract from Smith's translation of Thucydides.

'It is certain, that the region now known by the name of Greece was not formerly possessed by any fixed inhabitants, but was subject to frequent migrations, as constantly every distinct people easily yielded up their seats to the violence of a larger supervening number. For, as commerce there was none, and mutual fear prevented intercourse both by sea and land, as then the only view of culture was to earn a penurious subsistence; and superfluous wealth was a thing unknown, as plant-

ing was not their employment, it being uncertain how soon an invader might come and dislodge them from their unfortified habitations: and as they thought they might every where find their daily necessary support, they hesitated but little about shifting their seats. And for this reason they never flourished in the greatness of their cities or any other circumstance of power. But the richest tracts of country ever were more particularly liable to this frequent change of inhabitants, such as that which is now called Thessaly, and Bœotia, and Peloponnesus mostly except Arcadia, and in general every the most fertile part of Greece. For, the natural wealth of their soil increasing the power of some amongst them, that power raised civil dissensions, which ended in their ruin, and at the same time exposed them more to foreign attacks. It was only the barrenness of the soil, that preserved Attica through the longest space of time, quiet and undisturbed, in one uninterrupted series of possessors. One, and not the least convincing, proof of this is, that other parts of Greece, because of the fluctuating condition of the inhabitants, could by no means in their growth keep pace with Attica. The most powerful of those, who were driven from the other parts of Greece by war or sedition, betook themselves to the Athenians for secure refuge, and as they obtained the privi-

leges of citizens, have constantly from remotest time continued to enlarge that city with fresh accessions of inhabitants, insomuch that at last, Attica being insufficient to support the numbers, they sent over colonies into Ionia.' Vol. i, p. 4.

'The custom of wearing weapons once prevailed all over Greece, as their houses had no manner of defence, as travelling was full of hazard, and their whole lives were passed in armour, like barbarians. A proof of this is the continuance still in some parts of Greece of those manners, which were once with uniformity general to all. The Athenians were the first, who discontinued the custom of wearing their swords, and who passed from the dissolute life into more polite and elegant manners.' p. 7.

'Sparta is not closely built, the temples and public edifices by no means sumptuous, and the houses detached from one another, after the old mode of Greece.' p. 10.

'Such are the discoveries I have made concerning the ancient state of Greece: which though drawn from a regular series of proofs, will not easily be credited: For it is the custom of mankind, nay even where their own country is concerned, to acquiesce with ready credulity in the traditions of former ages, without subjecting them to the test of sedate examination. Thus for in-

stance it is yet a received opinion, that the Lacedæmonian kings had each of them a double and not a single vote in public questions; and that, amongst them, the Pittanate was a military band, which never yet existed. So easy a task to numbers is the search of truth, so eager are they to catch at whatever lies at hand!' p. 17, 18.

'And as for the actions performed in the course of this war, I have not presumed to describe them from casual narratives or my own conjectures, but either from certainty, where I myself was a spectator, or from the most exact informations I have been able to collect from others. This indeed was a work of no little difficulty, because even such as were present at those actions disagreed in their accounts about them, according as affection to either side or memory prevailed. My relation, because quite clear of fable, may prove less delightful to the ears. But it will afford sufficient scope to those who love a sincere account of past transactions, of such as in the ordinary vicissitude of human affairs may fully occur, at least be resembled again.' p. 19.

'After the engagement at sea, the Corcyreans having erected a trophy upon Leucimna a promontory of Corcyra, put to death all the prisoners they had taken, except the Corinthian, whom they kept in chains.' p. 25.

In reading through these articles there is not a single line that is inapplicable to the savages of America, if we except what concerns Attica, the occasional causes of the civilization of which were too remarkable for me to omit them.

A comparison of the history of ancient Greece and ancient Italy, considered and exhibited in this point of view, would form a work highly instructive. From it we might learn justly to appreciate a number of prejudices and illusions, by which our judgment is warped in infancy, and during the course of our education. We should there see what opinion we ought to form of that pretended golden age, when men wandered naked in the forests of Hellas and Thessaly, living on herbs and acorns: we should perceive, that the ancient Greeks were truly savages of the same kind as those in America, and placed in nearly similar circumstances of climate and soil, since Greece, covered with forests, was then much colder than at present. Hence we should infer, that the name of Pelasgians, believed to belong to one and the same people, wandering or dispersed about from the Crimea to the Alps, was only the generic appellation of the savage hordes of the first inhabitants, roaming in the same manner as the Hurons and Algonquins, or the old Germans and Celts: and we should presume with reason, that colonies of

foreigners farther advanced in civilization, coming from the coasts of Asia, Phœnicia, and even Egypt, and settling on those of Greece and Latium, had nearly the same kind of intercourse with these aborigines, sometimes friendly, sometimes hostile, as the first English settlers in Virginia and New England had with the American savages. By these comparisons we should explain both the intermixture and disappearance of some of these people: the manners and customs of those inhospitable times, when every stranger was an enemy, and every robber a hero; when there was no law but force, no virtue but bravery in war: when every tribe was a nation, every assemblage of huts a metropolis. In this period of anarchy and disorder of a savage life we should see the origin of that character of pride and boasting, perfidiousness and cruelty, dissimulation and injustice, sedition and tyranny, that the Greeks display throughout the whole course of their history: we should perceive the source of those false ideas of virtue and glory sanctioned by the poets and orators of those ferocious days, who have made war and it's melancholy trophies the loftiest aim of man's ambition, the most shining road to renown, and the most dazzling object of admiration to the ignorant and cheated multitude: and since, particularly of late, we have made a point of imitating these people, and consider

their politics and morals, like their poetry and arts, the types of all perfection, it follows at length, that our homage and our worship are addressed to the manners and spirit of barbarous and savage times!

The grounds of comparison I lay down are so true, that the analogy reaches even to their philosophical and religious opinions; for all the principles of the stoic school of the Greeks are found in the practice of the American savages: and if any should lay hold of this argument, to impute to the savages the merit of being philosophers, I would retort the reasoning and say, we ought on the contrary to conclude, that a state of society, in which precepts so repugnant to human nature were invented for the purpose of rendering life supportable, must have been an order of things and of government not less miserable than the savage state. And my opinion would be supported by the whole history of these Grecian tribes, even in their most brilliant periods, and by the uninterrupted series of their wars, seditions, democratic massacres, oligarchist and tyrannical proscriptions, &c., up to the time of their subjugation by those other savages of Italy, called the *Romans*, who in their character, politics, and aggrandizement, have a striking resemblance to the Six Nations.

With regard to religious notions, these do not form a regular system among the savages, because

every individual, in his independent state, makes himself a creed after his own manner. It seems too, that the introduction of European missionaries among them has modified their ancient and proper opinions: yet, to judge from the accounts of the historians of the first settlers, and those of late travellers in the north-west, it appears to me, that the savages pretty generally compose their mythology in the following manner:

First a great *manitou*, or superiour *genius*, who governs the Earth and the aerial meteors, the visible whole of which constitutes the Universe of a savage. This great manitou, residing on high, without his having any clear idea where, rules the World, without giving himself much trouble; sends rain, wind, or fair weather, according to his fancy; sometimes makes a noise (thunder) to amuse himself: concerns himself as little about the affairs of men, as about those of other living beings that people the Earth; does good, without taking any thought about it; suffers ill to be perpetrated, without it's disturbing his repose; and in the mean time leaves the World to a destiny or fatality, the laws of which are anteriour and paramount to all things. Most of these people give him the name or epithet of *Master of Life*, or *He who made us*: but this title may have been derived from the missionaries. Under his command are subordi-

nate *manitous* or genii innumerable, who people Earth and air, preside over every thing that happens, and have each a separate employment. Of these genii some are good, and these do all the good that takes place in nature: others are bad, and these occasion all the evil that happens to living beings. It is to the latter chiefly, and almost exclusively, that the savages address their prayers their propitiatory offerings, and what religious worship they have, the object of which is to appease the malice of these manitous, as men appease the ill-humour of morose and envious men. They offer little or nothing to the good genii, because they would do neither more nor less good on this account; which proves with how much reason Lucretius said,

> ' Primus in Orbe deos fecit timor :'
> The fears of man first to the World gave gods.

This fear of evil genii is one of their most habitual thought, and that by which they are most tormented. Their most intrepid warriors are in this respect no better than the women and children: a dream, a phantom seen at night in the woods, or a sinister cry, equally alarms their credulous and superstitious minds; but as wherever there are dupes knaves will start up, we find in every savage tribe

some *juggler*, or pretended *magician*, who makes a trade of expounding dreams, and negotiating with the manitous the business and desires of every believer. He acts precisely the parts of valets in old comedies, who carry messages between lovers that cannot see one another; and it may be well supposed, that this kind of courtship is not without profit to him by whose intervention it is carried on. The missionaries have a particular aversion to these jugglers, whom they style quacks, impostors, and knaves: while the jugglers, who term them envious supplanters, bestow on them in turn the same titles. Notwithstanding their intercourse with the genii, they are greatly puzzled to explain their nature, form, and aspect. Not having our ideas of *pure spirit*, they suppose them to be corporeal substances, yet light, volatile, true shadows and manes after the manner of the ancients. Sometimes they and the savages select some particular one, whom they suppose to reside in a tree, a serpent, a rock, or a cataract, and him they make their *fetish* like the negroes of Africa.

The notion of another life is a pretty general belief too among the savages. They imagine, that after death they shall go into another climate and country, where game and fish abound, where they can hunt without being fatigued, walk about

without fear of an enemy, eat very fat meat *, live without care or trouble, in short be happy in every thing that constitutes their happiness in this life. Those of the north place this climate toward the south-west, because the summer winds, and the most pleasing and genial temperature come from that quarter. The missionaries add, that to this picture they annex the idea of reward and punishment, a sort of Elysium and of Tartarus; but this requires to be confirmed by impartial observers.

The sketch I have just traced, however, is sufficient to prove, that there is a real analogy between the mythological ideas of the savages of North America and those of the Asiatic Tatars, as they have been described to us by the learned Russians, who have visited them within these thirty years. The analogy between them and the notions of the Greeks is equally evident. We discern the great manitou in the Jupiter of the heroic ages, or of the savage times; with this difference,

* All who live in the woods come at length to love only the fat of meat. The lean passes through the stomach too quickly; on which account the Canadian traders call it *viande-pain*, meat-bread. I have experienced this taste in myself, and like them went so far as to prefer a piece of bear's flesh to the wing of a turkey.

that the manitou of the Americans leads a melancholy, poor, and wearisome life, like themselves; while the Jupiter of Homer and of Hesiod displays all the magnificence of the court of Ethiopia, that is of Hecatompylean Thebes, the wonderful secrets of which have been disclosed to us in the present age *.

In the other manitous are equally evident the subordinate deities of Greece, the genii of the woods and fountains, and the dæmons honoured with a similar superstitious worship. The conclusion I would draw is not by any means, that the American savages have derived their notions from Greece or Scythia: it is possible, that Shamanism or the Lamic system of Budda spread itself among all the savages of the old world, where it is found even to the extremities of Spain, Scotland, and Cimbrica: but to me it appears equally possible, that it may be the natural production of the human mind; for an accurate analysis shows it to be formed of comparisons drawn from the condition and affections of the persons and people among whom it exists. As I have enlarged on this idea in an-

* See in the elegant work of Mr. Denon the high degree of taste, luxury, and perfection, at which the arts had arrived in that Thebes, which was buried in the night of history before Greece or Italy was known.

other place, I need not here repeat what I have already said *.

A transmission of these ideas, that would take for granted too long a series of generations, appears to me particularly difficult, inasmuch as neither books, nor writings, nor any means of record exist among the savages. With them every thing is confined to oral tradition, that is to those narratives, which, as they pass from mouth to mouth, are so altered, that even neighbouring facts be-

* See the Genealogy of Religious Ideas in my Ruins. The christian missionaries, catholic, protestant, and moravian, have taken great pains to convert the savages. The society of Jesuits, by it's insinuating manners, succeeded best in bringing them to outward forms of worship; but the rude good sense of these men could never bow or open itself to the belief of incomprehensible dogmas. They went to mass, and said their Pater nosters, creed, and Ave Maries, for the sake of the bread that was distributed among them, and the gift of which indulged their idleness: but I never heard an instance in the United States of a single savage really become a christian. When therefore a celebrated author among us builds the interest of a recent romance on the almost monastic devotion of a squaw, or young female savage, he has offended against the laws of probability, from which that interest must arise. If indeed his only object were to please one party, and to attain one end, he has succeeded completely, and may truly say, 'every road leads to Rome.'

come impossible to be known in a little time. I think I have rationally demonstrated, in treating of the Arabs *, to what a degree traditions are nullities among the Orientals, in spite of the contrary prejudice of some learned men, and particularly of theologians, who have need of them as a support to various opinions. I have proved, that among these people individuals scarcely bear in remembrance the number of years they have lived, or the events of their infancy: that this forgetfulness or negligence is a disposition they have in common with our own people, particularly country persons, who resemble them most in ignorance: and finally, that this character is inherent in human nature at large. The savages of America afford an additional example in support of my opinion; for all the witnesses I have had an opportunity of consulting, and whom I have so frequently quoted, agreed in telling me, that there does not exist among them any regular remembrance, or accurate tradition, of a fact that happened a hundred years ago. And their wandering, roving life, dispersions by war, distractions by calamities and distress, and radical carelessness, are to any one, who will calculate their effects, evident proofs that this must be so.

* Travels in Syria.

One single mean of remembrance takes place among them, that of phrases consisting of a certain number of syllables and rhyming to each other, more nobly styled *verses*, either spoken or sung: and in fact by the measure of these verses, and their rhymes, words and ideas are fixed in a precise and certain manner in the speech and the memory, and we may be always assured, that the piece is entire and not mutilated. Accordingly it is in fact to this simple and rustic idea, that the divine art of poetry owes it's origin: and for this reason it's first essays, it's most ancient remains, are extravagant tales of mythology, of gods, of genii, of ghosts, of spectres, or gloomy and fanatic pictures of battles, animosities, and revenge; as the songs of the bards of Ossian and Odin, and I will even venture to say the recorder of the wrath of Achilles, though he possessed more knowledge and superiour talents; all of them tales and representations according with the ignorant minds, disordered imaginations, and ferocious manners of the people, among whom they were produced.

I may be told, that the savages have a kind of hieroglyphics, by means of which they communicate ideas to one another; as drawing a man with one arm akimbo to signify a Frenchman, another

with his arms bound to represent a prisoner: but how imperfect, equivocal, and confined such a method must be, is obvious. The result in truth is, that they have neither means of transmission, nor monuments, nor even vestiges of any thing like antiquity. To the present day, throughout all North America, Mexico excepted, we have no mention of a building, or even a wall of hewn or sculptured stone, as a proof of ancient arts. All that exists is confined to a few barrows of earth, or tumuli, serving as tombs to the slain; and lines of circumvallation, including from one to thirty acres. I have seen three of these lines; one at Cincinnati, and two in Kentuckey, on the road from that place through Georgetown to Lexington. They are all simply mounds of ditches, at most four or five feet high, and eight or ten broad at the base. The figure of their circumference is irregular, in some instances oval, in others round, &c., and gives no idea of skill in the military or any other art. The largest of these works, that at Muskingum, is indeed square, and of greater dimensions: but from the representation and description of it given by Dr. Barton in his Observations on Natural History *, it appears to have neither bastions nor

* Part 1, 8vo, 76 pages. Philadelphia, 1787.

towers, as had been said; and must have been a simple intrenchment thrown up for defence, such as Oldmixon and his authorities affirm the savages practised at the arrival of the Europeans, when they had more fixed habitations, and a greater equality of strength. All these intrenchments have been produced by the same cause, and all may have been made with no other tools than hoes and baskets.

As to the tumuli, I have seen that at Cincinnati about six or seven hundred paces west from the fort. It is a heap of earth, resembling a sugarloaf, and raised perhaps forty feet above the ground. It is covered with trees, that have grown spontaneously. It recalled to my mind the barrows in the desert of Syria and it's frontier; though these are infinitely stronger, their purpose being to support towers. It appears, that many are met with in Russia and Chinese Tatary much more resembling them in figure*. Some of the American tumuli have been opened, and nothing found in them but bones, and the bows, arrows, and hatchets of savage warriors. General Sinclair, having cut down one of the largest trees growing on them, counted upwards of 432 circles of growth in it;

* They are said also to be very like those common in Britain. T.

and as one of these circles appear to be formed annually, this would refer the date of the tomb to the year 1300 or 1350.

Ampler researches, however, and more solid conjectures, must be left to the learned of America, who are on the spot, and who may every day make new discoveries. I repeat, that the most certain and instructive of all the monuments the savages exhibit is their language. Dr. Barton has published a curious essay on this subject*, in which he compares several words of their languages and dialects: he has even extended his comparisons to the languages of some Tatar tribes, by the help of the collection that Dr. Pallas made and published of near three hundred Asiatic nations, by order of the empress Catharine II †. The

* See New Views on the Origin of the Tribes and Nations of America, one vol. 8vo. Philadelphia, 1798.

† This work, the truly philosophic idea of which had for it's object to elucidate and diminish the Babelish confusion of tongues, has been printed in Russian characters. May I be permitted to observe, that this mode of execution is repugnant to the design: the Russian characters are confined to a nation far from rich in books, and but little advanced in the sciences: the letters called Roman are become those of all Europe; they will soon be used exclusively in Germany and throughout America. Surely the Russians do not design to supplant them. Would it not have been, will it not be at present, more convenient for the Russians, to adopt them, and join the great body of people, embracing for the sounds

comparisons of Dr. Barton have led him to several conclusions interesting to the man of science: but, notwithstanding my wishes for his success, proceeding from esteem and friendship, I do not find all his conclusions equally well founded. For instance, I cannot admit the affinity he would establish between the dialects of the Caribbees, Brasilians, Peruvians, &c., and the languages or dialects of the Putewoatamies, Delawares, and Six Nations, founded on the resemblance of two or three words. He appears to me more happy in some affinities he discovers between them and the languages in the north-east of Asia. We cannot however but pay our acknowledgments to him for having opened a curious mine rich in novelties: but this mine requires to be explored to the bottom, and on a large scale, a labour that would require the united efforts of many learned men. It is much to be wished, that congress, feeling the importance of the subject, would establish, were it but temporarily, a school of five or six interpreters, employed solely to collect vocabularies and grammars of the savages. In one or two centuries perhaps not one of these people will

peculiar to themselves a mode similar to that, which the French government has just pursued for the Arabic, Turkish, and Persian alphabets, that is, appropriating to them letters equally peculiar? By this they would spare themselves much trouble and expense.

any longer exist. Within the last two hundred years a great number has already disappeared: if the present time be suffered to pass away, all opportunity of seizing the only clew to the analogy and affiliation of these nations with those of the north-east of Asia will be irrecoverably lost: the expense of such an establishment is a trifling object to a frugal and wealthy country: besides, an expense of this kind has beneficial and even lucrative consequences, were it solely for the advantages it affords trade, and the profits that would accrue from the sale of books.

In submitting this idea to the members of congress, friends of literature and the sciences, I venture to recommend it to them the more strongly from this circumstance, that I have observed a pernicious prejudice prevailing in the United States; which is, that Government should not encourage the cultivation of the sciences and letters, but leave them like other arts to the industry of individuals. This comparison with other arts is altogether erroneous, since to cultivate literature and the sciences with success, a man must renounce all pursuit of employments, places, and even fortune; he must have a mind free from the cares both of wealth and of poverty; he must love nothing but labour and fame, or if you will celebrity: but, to fulfil all this, he must be above want, possess all the necessaries,

nay the comforts of life, and even a moderate competence ready provided to his hands. The endowments and salaries allowed by governments, and the funds appropriated to the establishment of learned societies, answer this end. If in this respect France have acquired a degree of superiority in Europe, that no one disputes, it is indebted for it to such a system: and the advantages it has constantly derived from it, even pecuniary, commercial, and financial, are so evident, that no one of it's different forms of government thought proper to alter it. The government of the United States has it in it's power, to acquire the same influence, the same preponderance over all the New World, where their people have taken the first steps in the career of freedom. An annual fund of a hundred thousand dollars would be a very moderate expense for such a people; yet would be sufficient to create an American academy or institute, that in a short time would render important services, were it merely by preventing it's being said, as I have often heard from the mouths not of strangers only, but of the most enlightened men of the country, that a taste for the sciences, and the cultivation of them, far from having made any progress, had on the contrary cooled very perceptibly in the United States since the establishment of their independance, and that the education and in-

struction of youth had fallen into alarming neglect and disorder.

It remains for me to add the Miami vocabulary; that I announced in the beginning of this article. This dialect appears to belong to the language of the numerous Chipewan tribes, who, according to Mr. Mackenzie, say they came from the north-east of Asia. However imperfect my performance may be, it is nevertheless of sufficient extent, to furnish the learned Russians and Germans, who understand the languages of those countries, with means of comparing them: and if it serve to procure some discoveries from that quarter, and stimulate the United States to a scheme of more extensive and profound research, I shall have attained my object.

MAP
of the
UNITED STATES
of
NORTH AMERICA
For Volney's View of the Climate & Soil of the United States
Longitude West 80 from Paris
Latitude North
Lake Superior
Lake Huron
Lake Michigan
Lake Ontario
Lake Erie
UPPR CANADA
LOWER CANADA
NEW YORK
PENNSYLVANIA
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
NEW HAMPSHIRE
MAINE
NOVA SCOTIA
NEWFOUNDLAND
NEW BRUNSWICK
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
EAST GEORGIA
WEST GEORGIA
TENESSEE
KENTUCKY
NORTH WEST TERRITORY
UPPR LOUISIANA
LOWR LOUISIANA
WEST FLORIDA
E FLORIDA
NORTH ATLANTIC OCEAN
GULF OF MEXICO
Extensive Plains covered with high & woody Plants
Country of the Miamis
Desert Savannahs
Country of the Chickasaws
Country of the Chactaws
Country of the Creeks
Quebec
Montreal
Boston
Philadelphia
Washington
Richmond
Charlestown
Savannah
Columbia
C. Hatteras
Cape Sable
Cape Cod
Nantucket
Magdalen Is
Cape Breton
Anticosti I.
Mouth of the River St Lawrence
Mississippi
Missouri
Ohio
Cumberland Mountains
Alleghany Mountains
Frankfort
Lexington
Pittsburg
Lancaster
Trenton
New York
Portsmouth
Halifax
Kingston
Niagara
Black River
Oswego
Detroit
Michilimackinac
Fort Chartres
Kaskaskias
Natchez
New Orleans
Mouths of the Mississippi
St Marys River
Pensacola
Apalachicola R
Chattahoochee R
Tallapoosa R
Coosa R
Tennessee R
Cumberland R
Green River
Wabash R
Illinois R
Miami R
Sandusky R
Muskingum R
Kanawha R
Monongahela R
Susquehanna R
Delaware R
Hudson R
Connecticut R
Kennebec R
Penobscot R
St John R
St Lawrence R
Ottawa R
St Peter
St Francis
Red River
White Bear I
Falls of St Mary
Mistissinny L
Land ceded to the Chickasaws
Land ceded to the Chactaws
Land ceded to the Creeks
Land ceded to the United States
Published 1st April 1796 by J. Johnson St Paul's Church Yard

RPJCB

VOCABULARY

OF THE

MIAMI LANGUAGE.

Note.—The reader will observe, that the the x has always the guttural sound of the Spanish j or Greek χ.

The H that of the strong Arabic aspiration.

The th as in English.

While I have represented the pronunciation of the Miami words in French with all possible care, I have added some examples of the mode in which the English represent them also, in order to point out the confusion, that arises from the different powers we affix to the letters, and the necessity of a uniform alphabet.

Where the English pronunciation has a B subjoined it was taken from Dr. Barton; in the other cases it is by Mr. Wells *.

* The Vocabulary would certainly have been more valuable to the English reader, had this been done with all the words; and to supply the deficiency I consulted a friend, who has very attentively studied the French pronunciation. But, on comparing Mr. Volney's mode of representing the sounds with those of Mr. Wells and Dr. Barton, there appeared such a difference, as gave him reason to apprehend, that there was more danger of misleading the reader by the attempt, than probability of instructing him: accordingly it was thought more advisable, to leave him to make out the pronunciation for himself. T.

English.	*Miami after the French Orthography.*	*Miami after the English.*	*Remarks.*
I	Nêlah . . .	Nalaugh . .	ê is equivalent to
Thou and you	The *you* is used for both.		the French ée, that is to the long e.
He, she . . .	See *they* . . .	Awaleaugh.	
We	Kêlônah . .	Calonaugh.	
You	Kêlah . . .	Calaugh.	
They	Aouèloùa (oua short) . . .	Awalewaugh.	
Mine . .	Nêlah-néněh .	Nalaugh-nenigh.	
Thy . . .	Ki. See *Your* .		
His, Hers . .	Aouèla-néněh .	Awalelah-nennegh.	
Our . .	Kêlônah . .	Calonaugh.	
Your . .	Kêlêla-néněh .	Kalelaughnennagh.	
Their . .	See *His* . . .		
Father (my) .	Noxsâhé . . .	{ Nosh saugh. Noch sau. B.	
Fathers (the) .	Oxsema . . .		
Mother (your) .	Kekiah . . .	Kakecaugh.	
Mothers (the)	Akêmêmah . .	Aukeemeemauh. B.	
Son . .	Akouissimà . .		
His son . .	Akouissâleh . .	Augwissaulay.	
His daughter .	Atanâléh.		
My brother .	Ouedsà milâné .	Sheemah, taken for *sister.* B.	
Our brother .	Ouedsa-monkouà		
My sister . .	Ningo chema.		
Their sister .	Agoz-chimouâlé	Augoshim wauley	
My husband .	Nêna pêma. Literally *master of weakness.*		

English.	*Miami after the French Orthography.*	*Miami after the English.*	*Remarks.*
My wife	Ninouéouah	Neeweewah. B.	
A woman	Métamsah		
A man	Helaniah	Hellaniare.	In Delaware, Lenno, Chipeway, Lennis *, Shawnese, Linni. Why were the ancient Greeks called *Hellenes*? And a Tatar tribe *Alani?*
A little boy	Apilossah	Apeelotsaugh.	
An old man	Kéocha	Kaowshaw.	
One	Ingôté	Ingôtay.	
Two	Nichoué	Neshsway.	
Three	Nexsoué	Nessweh.	
Four	Nioué	Neeway.	
Five	Yàlanoué	Yallawnwee.	
Six	Kakotsoué	Cau cutsweh.	
Seven	Souaxtetsoué	Swattetssweh.	
Eight	Pollâné	Pullawneh.	
Nine	Ingôté-ménéké	Ingotim maneeka.	
Ten	Matatsoué	Mautotsweh.	
Head	Indêpékòné		
Eye	Kéchékoué.		
Nose	Kiouâné.		
My nose	Nin-kiouâné.		
Your nose	Ki-kiouâné.		
Ear	Taouâké.		
Forehead	Margaouinguilé		
Hair (of the head or body)	Nélissah.		
Mouth	Tonénéh.		
Tongue	Ouélâné.		
Tooth	Ouipîtâh.		

* Ninnee. Long, p. 204. T.

English.	*Miami after the French Orthography.*	*Remarks.*
Beard	Messetoningué.	
Hand	Onexkà.	
Foot	Kâtah.	
Skin	Kôkaié.	
Flesh	Ouioxsé.	
Blood (See *Red*)	Nixpékénoué.	
Heart	Tâhé.	
Belly	Moïgué or Moïtcze	Pronounced in the Russian manner.
Life	Mahtsanéouingué	
Death	Nahpingué . Nipon (*He is dead*)	It belongs to the inhabitants of the north only to class the ideas of sleep, death, and cold, in one family.
Sleep	Nipangué . Nipahanoué (Coldness.)	
To kill	Anguéchéouingué	
Day	Ispêté.	
The Sun	Ispêté-kilixsoua (*Light of day.*)	
Night	Pekontèoué.	
The Moon	Pekontèoué kilixsoua (Light of Night.)	
Morning	Cheïpaoué,	
Evening	Elakouîkéx.	
A Star	Alangouâ.	
The Firmament	Kechekoué.	
Wind	Alamthenoué.	
Thunder	Tchingouia.	
Rain	Petilenoué.	
Snow	Monê toua (a genius or spirit.)	
Ice	Achonkôhéh.	
Hot	Chilitèoué	
Cold	Nipâhanoué.	

English.	*Miami after the French Orthography.*	*Remarks.*
Summer	Nihpênoué	I suspect a mistake here. Winter in the Chipeway is *bebone*, in the Algonquin *pepoon*; summer or spring, in the former, *menokemeg*, in the latter, merockamink. Between the Miami and the Chipeway languages there is sometimes a striking resemblance, at others not the least. See Long's Voyages and Travels, at the end of which is a pretty copious vocabulary of different Indian languages, particularly the Chipeway. T.
Winter	Piponoué.	
The Earth	Akinkeoué.	
An island	Menàhanoué.	
Water	Népé.	
Fire	Kohteoué.	
Flame	Paukouâleoué.	
A river	Sipioué.	
A lake	NipiHsi.	
A rivulet	Maxtchékomeké.	
The sea	Kitchi-kâmé.	
A mountain	Atchioué.	
A hill	Ispotêhkiké.	
A tree	Metèhkoué.	
Trees	Metèhkonah.	
Wood	Taouânè.	
A forest	MteHkoke.	
A track (of game)	Pamehkaouangué	
To hunt	DonamaHoua.	
The chace	NaHtonama-ouingué.	
A bow	Mêtèhkouapa.	
An arrow	Tàouanthalouà.	
The leaves	Mechipakoua.	
(that) fall	Papintingué.	
(A man) falls	Mejechenouà.	
Game	Aouàssâh.	
Fish	Kikonassah.	
A warrior	Aâthià.	
War	Mejékatoué.	
To go to war	Dopaléouah.	
A Tomahawk	Takâ-kané.	
To paint the face	Ouèchihouingué.	

English.	*Miami after the French Orthography.*	*Remarks.*
A knife. Knives	Malsé. Malsa.	
To scalp . .	Laniok-koué.	Koué (the hair of the head.)
A prisoner .	Kikiouña.	
A path . .	Mioué.	
A tobacco-pipe (calumet)	Poàkâné.	
Smoke . .	Axkoleoué.	
A house . .	Ouikâmé.	
A boat . .	Missôlé, *in the plur.* Missola.	
A net . .	Sâpà, *plural* Sapake.	
Dried meat . .	Pohtekia.	
Smoked meat .	Oxkolé Saminguiá.	
A tomb . .	Eouissi-kâné.	
Peace . .	Pèhkokia *(good, abundance.)*	
Good (the subs.)	Pèhkôké.	
Bad (the subs.)	Mélèoxké.	
(a) Good (man)	Tipêoua.	
Wicked . .	(Fortè) Matchi *.	
Sweet † . .	Ouêkapanké.	
Bitter . .	Ouèssakangué.	
Long . .	Kenouake.	
Short . .	Ixkouaké.	
(a) High (hill) .	Ifpatingué.	
High (in the sky)	Ifpatingué.	
Low . .	Mataxké.	

* In general all words implying beautiful and good begin with a p; and on the contrary those that signify bad or ugly with an m.

† They call the bee the fly that makes sweet: they say that it is not a native of the country, and precedes the settlers a year. *Amohouia* is applied to all the genus. *Honzaoue-amohouia*, yellow fly, signifies a hornet.

English.	*Miami after the French Orthography.*	*Remarks.*
Slow, easy	. Quêhkeoué.	
Ready	. Kinsehkaoué.	
A cloud (rapid)	Kintche seoué.	
(a) deep (river)	Kenonoué.	
Smooth	. Têtipaxkeoué.	
Great	. MaHchôké, kitchi.	
Little	. Apilîké.	
Broad	. Metchahkeoué.	
Narrow	. Apassiaoué.	
Heavy	. Ktchokouâné.	
Light	. Nanguétchéoué.	
Iron	. Kepikàtoué.	
Copper	. Naxpekacheke.	
Gold	. Honzaouéchoulé	
Silver	. Choûlé *or* Tsoulé.	
Lead	. Lontsàh.	
A stone	. Sânê.	
White	. Ouàpekingué.	
Black	. MaHkateouekingué.	
Red	. NèHpèkékingué.	
Blue	. Ixkepakingué.	
Yellow	. Honzaouékingué.	
Green	. Anzanzékingué.	
A wild ox, or buffalo	. Alanantsoua.	
A beaver, or little deer	. MoHsoké.	
A bear	. Moxkoua, Maxkôké *in the plur.*	
A dog	. Alamo, *plur.* Alamòké.	
Indian corn	. Mintchepé.	

English.	*Miami after the French Orthography.*
A bird	Ahouèhsensa.
A friend	AouiHkanemah.
An enemy	KitaHkiamouna.
Love	Têpaletingué.
Laughter	Kéouélingué.
To laugh	Kéoueleouàh.
To weep	Sèhkouingué.
A tear	Sèhpingouah.
To speak	Kilakilaxkouingué.
A discourse	Atchimouna.
To walk	Pampelingué.
To run	Mahmikouingué.
To breathe	Nêssingué.
To blow	Alamsenoué.
To sigh	Kêouêneoua.
To fear	Kouahtamingué.
The mind, spirit or soul	Atchipaïà. That is, *a flying phantom.*
God	Kitchi Manêtoua (*The great spirit*) or Kajehelangouâ (*he who made us.*)
Genii or spirits	Manêtouâ, analogous to the *manes*, *mani-um* of the Romans.
The devil	Matchi manitou.
Beautiful	PeHkesina.
Ugly	Molêïousina.
A good man	Tipêoua-heleniah.
A good woman	Tipêoua-metamsa.
The savages	Metoxthéniaké (born of the soil.)
The Europeans	Ouâbkilokêta (white skin.)
The French	Mêhtikôcha (*Ouémistergôch* *, a builder of ships, in the Chipeway.)

* *Waymistergeash*, Long. But according to that experienced interpreter, a ship or great canoe is *kitchee naberquoin*; to build, *gowweajetoon*; and to make, *ojeytoon*, or *tojeytoon*. T.

English.	*Miami after the French Orthography.*
An Englishman	Axàlàchima.
An American	Mitchi-Malsâ (great knife.)
Yes	I-yè.
No	Moxtché.
With	Mâmàoué, in Arabic *mà.*

They have not the verb *to be.*

Their adjectives are of the common gender, as in English. See the example, *a good man, a good woman.*

In general the plural of substantives is formed by adding to the singular the final syllable ké. *Metamsa,* a woman; *Metamsaké,* the women.

The Verb To Eat.

I eat	Niouissini.
Thou eatest	Kiouissini.
He or she eats	Ouissinioua.
We eat	Niouissini mina.
Ye eat	Kiouissini moua.
They eat	Ouissiniouàké.
I have eaten	Chaïani ouissiné.
Thou hast eaten	Chaïaki ouissiné.
He or she has eaten	Chaïaé ouissinoua.
We have eaten	Chaïaé kiouissini-mina.
Ye have eaten	Chaïaé kiouissini-moua.
They have eaten	Chaiaé oussiniouaké.
I shall or will eat	Nouissini kâté.
Thou shalt or wilt eat	Kiouissini kâté.
He or she shall or will eat	Ouissinioua kâté.
We shall or will eat	Kiouissini-mina-kâté.
Ye shall or will eat	Kiouissini-mo-kâté.
They shall or will eat	Ouissiniouaké kâté.

English.	*Miami after the French Orthography.*
Eating	Ouessininguê.
Hunger	Aïxouingué.
I am hungry	Indâïexkoui.

The Verb To Drink.

I drink	Némênê.
Thou drinkest	Kimênê.
He or she drinks	Mênouà.
We drink	Kimênê mena.
Ye drink	Kimênê moua.
They drink	Mênó-ké.
Drink	Mêningué.

The Verb To Beat.

I beat	Indâné èhoué.
Thou beatest	Kidâné èhoué.
He or she beats	Anè èhoué.
We beat	Kidâné èhouemena.
Ye beat	Kidâné kioué (or hioué.)
They beat	Anêhé èhouaké.

The Passive Voice.

I am beaten	Indâné ekoua.
Thou art beaten	Kidâné ekoua.
He or she is beaten	Anè haouá.
We are beaten	Kidâné ekoua.
Ye are beaten	Kidâné ekoha.
They are beaten	Anè haouaké.
I have been beaten	Indâné nehèkoua.
Thou hast been beaten	Kidâné nehèkoua.
He or she has been beaten	Anènè haoua.

We have been beaten	. Kidâné nehekomena.
Ye have been beaten	. Kidâné nehekoua.
They have been beaten	. Anènè haouaké.
I shall or will be beaten	. Indâné heko-kâté.
Thou shalt or wilt be beaten	. Kidâné heko-kâté.
He or she shall or will be beaten	. Anè haoua-kâté.
We shall or will be beaten	. Kidâné hekomena-kâté.
Ye shall or will be beaten	. Kidâné hekoua-kâté.
They shall or will be beaten	. Anè haouaké-kâté.

THE END.

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05-133

ERRATA.

Page.	Line.	
69	17	*add*, See Plate I, fig. 2.
83	12	*for* a a *read* a a, Plate I, fig. 3.
	18	c c . b c
84	1	d d . c d
	7	e e . d e
304	2 from bottom,	*for* wit *read* parts.
394	Note,	*add*, the socks, or shoes, are called mocassins.

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